1/2002

MTC / REPORT / 01

IFFCO

KALOL UNIT

PLANNING SECTION

MAINTENANCE DEPTT.

REPORT NO. 22 / 2002

REPORT

ON

PLANT TURNAROUND

(MARCH - APRIL - 2002)

INDIAN FARMERS FERTILISER CO - OPERATIVE LIMITED

2

INDEX

3

PREFACE

Plant Turnaround for the year 2002 was planned during March - April 2002, accordingly, Ammonia & Urea plants were stopped on 20th March 2002. Rotating and static equipment were taken up for routine overhaul and inspection.

In Ammonia plant, preventive maintenance was carried out on all critical turbine/compressor trains. All the heat exchangers were also opened ,cleaned and boxed up. Leaking tubes of 127-CA / CB were replaced / plugged. All the critical RVs were overhauled, tested and were put back in place. Ultrasonic scanning was carried out of all the reformer tubes by M/s PDIL.

In addition to routine maintenance jobs, Air compressor drive turbine 101-JT and BFW pump drive turbine 104-JAT were taken for major overhauling. Waste heat boiler 101-CA and 101-CB were opened for replacement of distributor and liner and also to attend the leakage between outer and inner tube bundle flange of 101-CA. Retubing of 127-CA/CB, 128-C and 802-C were carried out with ASTM A-213 TP 304L tubes. Lube oil coolers of both 101-J and 103-J were replaced with new ones. Auxiliary boiler as well as 112-C were offered for IBR inspection.

In Urea plant, Hitachi compressor (K-1801) L.P. & H.P. Case, turbine (Q-1801) & gear box (M-1801) were taken for preventive maintenance. Prill tower ID Fans, Prill cooling system fans & scrapper taken for preventive maintenance. All heat exchangers were cleaned by hydrojetting & boxed up. Various RV's were overhauled & tested. Inspection of H. P. Vessels and L. P. Vessels were carried out. Bulged liner and insert liner of Autoclave were replaced.

H.P.Stripper (H-1201) was replaced by M/s. L & T make new H.P.Stripper.

In Offsites plant, Q-4411, Q-5112 and Q-5113 were taken for overhauling. Other pumps and turbines were also taken for preventive maintenance. As per recommendation of RLA study report and 5 years action plan approved by IBR authority Reexamination of Primary Super Heater outlet header has been carried out.

In B&MH plant preventive maintenance of Reclaim Machine M-2116 was carried out. Packer scales, Conveyor belt M-2110, M-2112, M-2117, M-2121, M-2122, & M-2124 (1-6) were also taken for preventive maintenance.

ELECTRICAL JOBS

All the feeders of MCC panels were thoroughly cleaned. Burnt out / damaged components of feeder were replaced. Tightness of connector were checked. All the Relays installed on panels were cleaned, checked, tested and calibrated. Damaged / faulty relays found during checking were sent to authorized service center for repairing. MCC 2B/2E was shifted to new location and connections of all the respective loads were resumed.

Preventive maintenance of all transformers were carried out. Marshaling boxes were checked. Insulation resistance between phase to earth were checked. OLTC of TR-1A, TR-1B, TR-1C were cleaned, inspected. Loose connections were tightened and its operations were checked. Oil of OLTC were replaced. Oil having low BDV value were filtered.

Overhauling of all the MOCBs were carried out. Closing and tripping time of all the MOCBs were checked and calibrated. Oil of all the MOCBs were found low BDV value and these were replaced with new one.

All the critical motors installed at various location in plants were overhauled. All the MOVs were thoroughly checked.

INSTRUMENT JOBS

During annual plant turnaround year-2002, Following instrumentation maintenance jobs were carried out.

In Ammonia plant , PGR Dryer Operation was changed from Semi DCS to full DCS. A new panel was installed, sequence table were prepared for PGR Dryer and it was successfully commissioned, removed old obsolete pneumatic drum programmer. In HIMA PLC system for, plant emergency shutdown system, two operator stations and one event recorder was upgraded with WINDOWS NT operating system and latest version of Wizcon SCADA software to eliminate frequent hanging problem with obsolete OS2 operating system. Job was successfully completed by HIMA GERMANY, German representative and their Indian counterpart M/s.Chemtrol Engg.,Mumbai. Leveltrol of Flash Drum was replaced by Masoneilan electronic type leveltrols and was hooked up to DCS to facilitate operation from control room for safety enhancement. Preventive maintenance jobs were carried out for 1 HIMA PLC System, DCS and Fuji UPSS to ensure reliability. Preventive maintenance of various field critical instruments like control valves, Transmitters, Thermocouples, switches, field controllers, panel wiring etc. was carried out.

In Offsite and Utility Plant, field instruments and control panel instruments like transmitters, alarm / trip switches, pneumatic controllers, recorders etc. were calibrated and checked for their reliable performance. Final steam temp. Cascade controllers (TRC-4 & TRC-5) in boiler plant were replaced with new microprocessor based controllers and electronic transmitters and provided additionally for Steam, Gas and Oil flow measurement. Various critical control valves were overhauled and their strokes were checked. Attemperator Steam temp. Control valve (TCV-2) in boiler plant was replaced with new one. Control power of ammonia plant UPS was provided to boiler control panel and instruments in addition to existing UPS power for better reliability.

In Bagging plant, instrument control panels (6 nos.) For packer scales were shifted to ground floor in dust proof control room. Also existing corroded local panels, solenoid boxes and junction boxes were replaced with new S.S.panels / boxes. Also carried out preventive maintenance of platform weighing machines, Datapond controllers, Belt weigher, control panels etc.

In Urea plant radioactive type level measurement system for the new stripper was installed and commissioned. The radioactive source of autoclave level measurement system was replaced with new source and Radiac relay was re-calibrated. All critical control valves were opened and overhauled. Mono block valve of N/C ratio meter was replaced with repaired one. Trip and alarm switches of Hitachi compressor, PB compressor and HP pumps were calibrated and trip system was checked. All old multi-pair and branch cables for Thermocouples were replaced with new extension cables. New junction boxes were provided for Thermocouples. Preventive maintenance and functionality checking were carried out for DCS. I/P Converters and Air Filter Regulators of all critical loops were replaced with new one. 6 nos. of pneumatic transmitters were replaced with smart electronic transmitter and two additional transmitters were provided. 5 Nos of local control loops were transferred to DCS. All quality affecting instruments were calibrated. All field instruments of Hitachi compressor were calibrated. Unused old cables and tubes were removed. Provided arrangements for weep-whole checking and for Ammonia leak test of autoclave. Various miscellaneous requirement of shutdown of other sections were provided like removal and reinstallation of instruments, provision of pressure and temperature gauges, etc.

It is also placed on the record that inspite of very serious communal riots all over the Gujarat and Ahmedabad, shutdown activities were completed successfully though curfew was imposed in various parts of Ahmedabad and Kalol.

TECHNICAL DEPARTMENT JOBS :

New schemes like (i) Mixing of hot and cold ammonia (ii) early startup of pre-reformer piping / instrumentation (iii) Utilization of 4 ata steam in LSHS Heater H-5113/C and diversion of condensate to CBD tank (iv) 14 ata control loop modification (v) Electrical portion for Auto changeover of LSHS charge pump etc were executed.

Replacement of 101/103/105-JLC lub oil coolers, LCV-13, Seal oil off gas lines , H.P.Stripper, BFW line's , Spring hangers etc. Carriedout and major approved schemes were executed.

Removal of LSHS heater H-5113 heater H-5113 A & B and various lines carried out as per approval.

6

PLANT TURNAROUND - MARCH - APRIL - 2002

GENERAL - DETAILS

SR. NO.	CATEGORY	QUANTITY
01	**EQUIPMENT UTILIZED :**	
	(A) **IFFCO :**	
	55 T HM Crane	01
	55 T TIL RT-760 Tyre mounted mobile 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
	(B) **HIRED :**	

02	**MANPOWER UTILIZED :**	
	(A) **IFFCO MANPOWER :**	
	a) Mechanical b) Mechanical Services c) Electrical d) Instrument e) Trainees in various trade	Existing strength

(B) **HIRED - CONTRACT MANPOWER :**

Sr.No.	Category	Man days
01	Mill Wright Fitter	188
02	General Fitter	1962
03	Rigger	3132
04	S.S. Rigger	6817
05	Fabricator	510
06	Grinder	509
07	IBR Welder	49
08	Non-IBR Welder	360
09	Carpenter	81
10	Mason	81
11	Forklift Operator	--
12	Instrument Fitter	257
13	Electrician	154
14	Machinist	138

7

THE PLANT TURNAROUNDS AT A GLANCE

SR. NO.	YEAR	AMMONIA PLANT				UREA PLANT				REASON IF ANY
		PERIOD FROM PRODUCTION TO PRODUCTION								
		FROM	TO	DOWN TIME		FROM	TO	DOWN TIME		
				DAYS	HRS			DAYS	HRS	
01	1975	06-05-75	21-05-75	16.00	-	06-05-75	21-05-75	16.00	-	Planned
02	1976	26-03-76	20-04-76	26.00	-	26-03-76	20-04-76	26.00	-	Planned
03	76-77	05-12-76	22-01-77	49.00	-	05-12-76	24-02-77	51.00	-	101-JT B/D
04	1978	21-02-78	15-03-78	23.00	-	21-02-78	25-03-78	31.00	-	101-BJ B/D
05	1979	21-05-79	30-06-79	41.00	-	10-05-79	01-08-79	82.00	-	K-1101/2, 3rd Stage Cylinder
06	1981	12-04-81	10-05-81	29.00	-	08-04-81	12-05-81	35.00	-	101-B Headers Planned
07	1984	01-01-84	25-01-84	25.00	-	01-01-84	25-01-84	25.00	-	Planned
08	1986	19-03-86	03-05-86	45.00	-	04-03-86	01-05-86	59.00	-	Reformer Revamping / HP Scrubber B/D
09	1987	12-04-87	03-05-87	21.00	-	12-04-87	02-05-87	20.00	-	Planned
10	1988	18-04-88	14-05-88	27.00	-	18-04-88	13-05-88	26.00	-	Planned
11	1990	05-02-90	05-03-90	29.00	688.67	31-01-90	07-03-90	35.00	829.00	Planned
12	1991	24-02-91	13-03-91	18.00	429.08	23-02-91	14-03-91	20.00	459.25	Planned
13	1992	03-11-92	03-12-92	30.60	734.91	03-11-92	04-12-92	31.00	744.75	Planned
14	1993	12-09-93	23-10-93	42.00	986.50	12-09-93	29-10-93	47.00	1120.58	Revamp-II
15	1995	14-01-95	27-01-95	14.00	311.34	11-01-95	26-01-95	16.00	352.18	Scrubber H-1203 -B/D
16	1996	14-06-96	13-07-96	30.00	712.00	13-06-96	13-07-96	30.00	694.25	Autoclave V-1201 Leakage
17	1997	12-05-97	17-06-97	35.60	875.00	12-05-97	17-06-97	36.20	870.50	Planned
18	1998	22-04-98	19-05-98	27.50	660.00	20-04-98	19-05-98	30.00	720.00	Planned
19	1999	12-04-99	30-04-99	18.00	434.50	11-04-99	28-04-99	17.00	409.75	Planned
20	2000	03-04-00	27-04-00	24.42	586.25	03-04-00	28-04-00	25.43	610.50	Planned
21	2001	25-03-01	14-04-01	20.90	501.50	25-03-01	15-04-01	21.26	510.25	Planned
22	2002	20-03-02	22-04-02	33.40	801.58	20-03-02	23-04-02	34.31	823.50	Planned

8

MAINTENANCE JOBS CARRIED OUT BY OUTSIDE AGENCIES

SR. NO.	JOBS CARRIED OUT	CONTRACTORS NAME	W.O.NO. & DATE
1	Overhauling & Preventive maint. of rotating equipment's in Ammonia plant	M/s. SPIC - SMO , Chennai	9911106 01/03/2002
2	Supervisory services for overhauling & testing of Relief valves in Ammonia	M/s. Flotech Engineering Service, Surat	9910752 24/02/2002
3	Scaffolding & Blinding / Deblinding jobs during shutdown	M/s. Anu Engineers, Vadodara	9910864 16/02/2002
4	Relining of castable refractory 102-B	M/s. A.C.C., Ahmedabad	9910856 16/03/2002
5	101-CA/CB Tube Bundle replacement.	M/s. Mahavir Engineering, Vadodara	9910969 01/02/2002
6	Retubing of 101-CA/CB (Waste Heat Boiler) Liner.	M/s. Skywin Erectors, Ahmedabad	9911143 05/03/2002
7	Retubing job of 127-CA/CB	M/s. Nigasu Engineering, Mumbai	9911155 01/03/2002
8	Retubing job of 128-C	M/s. Patel Air Temp, Ahmedabad	9911194 28/02/2002
9	Retubing job of 803-C	M/s. Nigasu Engineering, Mumbai	99111500 28/05/2002
10	Hiring of Crane	M/s. Petrone , Mumbai	9911233 26/03/2002
11	Relining Castable Refractory 101-CA/CB (Repair jobs)	M/s. A.C.C.,Ahmedabad	9911921 08/08/2002
12	Insulation of Transition zone.	M/s. Lloyds, Mumbai.	9911002 08/02/2002
13	Prefabrication of Liner for Autoclave (V-1201)	M/s. L & T, Mumbai	9911230 28/03/2002
14	Replacement of Liner of Autoclave.	M/s. L & T., Mumbai	9911231 28/03/2002
15	Overhauling and Testing of Relief Valves.	M/s. Flotech Engineers, Surat	9910619 02/01/2002
16	Cleaning & Replacement of plate of OHE (H-1206)	M/s. Alfa Laval Ltd.	9910949 25/01/2002
17	Painting of Underground Cooling Water pipe line	M/s. Swati Corporation, Ahmedabad.	9911045 16/02/2002

SR. NO.	JOBS CARRIED OUT	CONTRACTORS NAME	W.O.NO. & DATE
18	To Carry out reexamination of Primary Super IIeater.	M/s. BHEL, Trichy	9910592 28/12/2001
19	IBR Fabrication jobs.	M/s. Skywin Erectors, Ahmedaabd.	9911121-01/03/2002
20	Gland Repacking of valves of various sizes & refitting.	M/s. Dandy Engineering Company, Ahmedabad.	9911266 28/04/2002
21	Overhauling of RIM.	M/s. EMTICI Engineering Co.Ltd.	9910771-25/01/2002
22	Supply & Erection of Split Skirt Rubber for M-2121 Conveyor Belt.	M/s. Rampur Engineering Co.Ltd. New Delhi.	9909148 03/03/2001
23	Automatic Ultrasonic scanning of Reformer Catalyst tubes.	M/s. Projects & Development (I) Ltd., Sindri	9910530 04/01/2002
24	Radiography Work at site on round the clock basis	M/s. NDT Services, Ahmedabad	9910531 28/11/2001
25	Services of NDT Teams for Ultrasonic thickness measurement, Flaw detection, MPI & DP testing	M/s. IXAR Pvt.Ltd, Mumbai	9910647 07/01/2002
26	Repair & Maint.of BITUMASTIC acid lining in Water Treatment Weak & Strong effluent pit etc.	M/s. Shreeji Chem, Vadodara	9910862 19/01/2002
27	Applying Epoxy painting in RCC structure of B&MH plant hopper, floor & transfer tower	M/s.B.Chauhan & Co.,Kalol	9910944 07/02/2002
28	FRV lining on floor drain in water treatment plant & repairing of open channel near lagoon phase-B	M/s.Wester Corrosion Engrs., Vadodara	9911029
29	Repairs of refractory of primary reformer in Ammonia plant.	M/s. Associated Cement Co.Ltd., Ahmedabad	9911066 21/02/2002
30	Repairs of AC sheet for louvers & side cladding in Urea and Ammonia side cooling towers.	M/s.Anant Builders, Ahmedabad	9910863 19/01/2002
31	P/A IP concrete protective coating on RCC wall of prill tower, conveyor gallery & other structural in plant.	M/s.Krishna Conchem,	9910930 24/01/2002
32	P/A Epoxy Monolithic plaster & Epoxy painting on RCC suspender, walkway for conveyor, beams, column & stair of transfer tower of SILO & Misc.work in B&MH Plant.	M/s.CHEMISIGHT Engineers , Vadodara	9911057

40

SR. NO.	JOBS CARRIED OUT	CONTRACTORS NAME	W.O.NO. & DATE
33	Maintenance of RCC structure & conveyor gallery bottom from Silo to B&MH Plant.	M/s.Shree Sair Rang , Kalol	
34	Shifting of debris / Malvas etc. From various location in plant.	M/s.Gayatri Construction Co, Shertha.	9910938 25/01/2002
35	Relay Testing	M/s.Alstom Ltd.,Mumbai	9911032 15/02/2002
36	Servicing and Inspection of HHE make OLTC	M/s.Easun-MR Tap Changers(P) Ltd..Thirunninuvar	9910981 14/02/2002
37	Servicing and Inspection of CTR make OLTC	M/s.CTR Manufacutring Industries, Pune.	9911041 13/03/2002
38	Overhuling of 66 KV MOCBs.	M/s.Sun Gen.Tech (P) Ltd., Secunderabad.	9911280 08/04/2002
39	Shifting of MCC-2 B/E	M/s.AN Electricals, Gandhidham.	9911333 02/04/2002
40	AMC for DCS	M/s.YBL , Vadodara	9910060 11/10/2001
41	AMC for UPS	M/s. I/L.,Jaipur	9909749 26/07/2001
42	AMC for HIMA PLC.	M/s. Chemtrol Software Pvt.Ltd., Mumbai	9901985 12/06/2001
43	FICV 16/17 modification Commissioning of radioactive level measurement system of new CO2 Stripper.	M/s. Concord International, Chennai	9910279 16/10/2001
44	Maintenance, Servicing and Verification of Weighing Scales.	M/s. Mettlor - Toledo Pvt. Ltd.,	9910344 01/01/2002
45	Maintenance, Servicing and Verification of 40 MT Weighing Scales.	M/s. SHBE Systems Pvt.Ltd.	9910622 01/01/2002
46	Servicing & verification of 40T weigh bridge	M/s. Gujarat scale Industries, Ahmedabad	9900670 21/09/2000
47	Maintenance and Servicing of Allen Bradley PLC in DG sct and Bagging plant.	M/s. PIMA Control Pvt.Ltd.	9911546 25/06/2002
48	Maintenance & Servicing of Enraf make servo level gauge in Ammonia Plant.	M/s. Toshbro Ltd.	9909694 19/06/2001

SR. NO.	JOBS CARRIED OUT	CONTRACTORS NAME	W.O.NO. & DATE
49	Maintenance and Servicing of Belt weigher system in Silo.	M/s. EMTICI Engg.Ltd.	9911437 29/02/2002
50	Maintenance and Servicing of Silica Analysor.	M/s. Vortex Electronics.	99105040 07/01/2002
51	Installation of LO Coolers, 101/105-JLC & 103-JLC	M/s.Garcem Engineers, Ahmedabad.	9909166 16/03/2001
52	Replacement of Vibrating Screens.	M/s.Chaitanya Construction Pvt.Ltd.	9910657 18/12/2002
53	Supply & Application of Hot Insulation on PG-7 line.	M/s.Balaji Insulation.	9911371 11/04/2002
54	Dismantling, Fabrication & Erection of piping in Ammonia & Urea plant.	M/s.Chaitanya Contractors & Engineers Pvt.Ltd.	9911018 11/03/2002
55	Dismantling, Fabrication & Erection of piping in Ammonia & Urea plant.	M/s.Chaitanya Contractors & Engineers Pvt. Ltd.	9911171 11/03/2002
56	Removal, Shifting of the existing HP Stripper, Erection & Commissioning of new HP Stripper & dismantling & Re-Erection of pipe lines.	M/s.Petron Engg.& Construction Ltd.	9910784 07/01/2002
57	4 Ata venting scheme jobs in Boiler, Insulation work of Heat Recovery of Blow down water of Boiler Blow down Drum (Ammonia plant)	M/s. A To Z Inst. Services, Vadodara	9908684
58	Isolation & removal of 14 Ata to 4 Ata steam for LSHS heaters system installment in Boiler Area.	M/s. A To Z Inst. Services, Vadodara	9908684

12

PLANT ANNUAL TURNAROUND - MARCH/APRIL - 2002

AMMONIA PLANT

MECHANICAL JOB

CODE NO	JOB DESCRIPTION

01 01 01 AIR COMPRESSOR TRAIN :

Air Compressor Drive Turbine 101-JT Overhauling

Air Compressor drive Turbine was revamped for capacity enhancement in the year 1997 annual shut down and since it was running normal. This turbine was taken for overhauling during annual shut down in April 2002 after continuos 5 years running under preventive maintenance schedule.

Following jobs were carried out in turbine 101-JT during the overhauling

The turbine was handed over to Maintenance at 14.00 hrs. on 14/04/2002

1) **Dismantling of Turbine**

- Turbine was decoupled from LP Compressor.
- Removed exhaust pipe and bellow
- Recorded the existing rotor float
- Turbine casing bolts loosening
- Governor assembly removed
- Inboard and out board bearing outer covers removed
- Recorded clearances in journal bearings
- Total floats without thrust pads recorded (clearance of first wheel with the nozzle)
- Casing top cover along with the steam chest valve lifted after stud opening
- Recorded all labyrinth clearance (Data sheet is attached) before removal of the same
- Removed the rotor
- All diaphragms were removed from casing
- Diaphragm 6 top locking screw got broken which was removed by drilling

Mechanical cleaning of diaphragm and rotor carried out. Outer sealing faces of some of the diaphragms and moisture rings found eroded. No significant erosion observed in the casing sealing grooves. Rotor found in good condition. Guess measurement carried out and found less than 3 gucss.

CODE NO JOB DESCRIPTION

2) **Re assembly of Turbine**

- Top and bottom casing properly cleaned
- Reconditioned diaphragm issued from store and replaced except 1st ,2nd & 8th
- LP Gland Labyrinth at steam inlet side replaced by new one.

1) Same rotor used after mechanical cleaning and run out checked found within limit (0.01 mm) and magnetism level measured found 3 to 4 gauss at journal portion.
2) Rotor was placed and all clearances recorded. (Data sheet attached).
3) Diaphragm and wheel labyrinth clearances were found within design limit. (Data sheet attached) Nozzle clearance was found to be 1.9 mm.
4) The same was reduced by adjusting positioning shim.
5) Final nozzle clearance is 1.6 mm.
6) Axial floats, bearing clearances were checked & recorded and found OK.
7) Steam chest cover boxed up with copper gasket.
8) Top cover boxed up.
9) Greasing of Nozzle operating gear linkages.

Coupling between LP compressor and Turbine

Distance between shaft ends	:	243.170 mm
Spacer Length	:	236.540 mm
Difference	:	6.630 mm
Design Prestrech	:	2.075 mm
Shim required	:	4.555 mm
Actual Shim	:	4.500 mm
(12 x 0.375 mm)	:	
Final Prestrech after shimming	:	2.020 mm

101-J LP Air Compressor Preventive Maintenance

1) Both the journal bearings as well as thrust bearings were inspected and found to be O.K.
2) LP Compressor to Turbine decoupled and alignment checked & corrected.
3) LP Compressor turbine end axial probe mounting was changed from gear box end to turbine end since the same was fouling with the dry coupling hub between LP Compressor and Gear Box. However the mounting of the probe is done on the oil guard bottom half only.
4) All the bag filters as well as Roll-O-Matic filters were replaced by new one.

14

AIR COMPR. TURBINE 101 JT

DATE :-

RECOMMENDED CLEARANCES		MIN.	MAX.		MIN.	MAX.
	A	0.002"	0.004"	J	0.055"	0.065"
	B	0.007"	0.009"	K	0.110"	0.120"
	C	0.015"	0.021"	T	0.008"	0.012"
	E	0.018"	0.019"			

MAX. PERMISSIBLE END FLOAT = 0.042"

TOTAL DESIGN END PLAY = 0.180"

101 JT — LOOKING FROM GOVERNOR END

105 JT — LOOKING FROM GOVERNOR END

AFTER	BEFORE	FINAL SHROUD	FINAL BLADE		FINAL BLADE	FINAL SHROUD	BEFORE	AFTER
				STEAM FLOW				
				OIL RING A				
				THRUST BRG. T				
				OIL RING A				
				BRG. B				
				OIL GUARD C				
				E				
				E				
				E				
				E				
				E				
				E				
				NOZZLE				
				J WHEEL-1				
		0.072"	0.072"	DIAPH. LABYRINTH E	0.088"	0.088"		
				J WHEEL-2				
		0.068"	0.060"	DIAPH. LABYRINTH E	0.096"	0.064"		
				J WHEEL-3				
		0.088"	0.076"	DIAPH. LABYRINTH E	0.080"	0.080"		
				J WHEEL-4				
		0.076"	0.072"	DIAPH. LABYRINTH E	0.072"	0.080"		
				J WHEEL-5				
		0.056"	0.060"	DIAPH. LABYRINTH E	0.060"	0.064"		
				J WHEEL-6				
		0.108"	0.112"	DIAPH. LABYRINTH E	0.100"	0.112"		
				K WHEEL-7				
		0.108"	0.108"	DIAPH. LABYRINTH E	0.116"	0.120"		
				K WHEEL-8A				
				DIAPH. LABYRINTH E				
				DIAPH. LABYRINTH E				
		0.126"	0.126"	K WHEEL-8B	0.126"	0.132"		
				E				
				E				
				E				
				E				
				OIL GUARD C				
				BRG. B				
				COUPLING				

NOZZLE CLEARANCE = 0.064"
TOTAL FLOAT = 0.176"
AXIAL THRUST = 0.116"

CODE NO JOB DESCRIPTION

Coupling between LP Air compressor and Gear box

Distance between shaft ends	:	183.94 mm
Spacer Length	:	181.04 mm
Difference	:	2.90 mm
Design Prestrech	:	0.45 mm
Shim required	:	2.45 mm
Actual Shim provided (6 x 0.375 mm):		2.25 mm
Final Prestrech after shimming	:	0.65 mm

101-JR Gear box Preventive Maintenance

1) All the journal bearings were inspected and found to be O.K.
2) Both the gear as well as Pinion were inspected and found to be O.K.
3) Gear box to HP Compressor decoupled and alignment checked and corrected (Readings attached)

101-J HP Air compressor Preventive Maintenance

Both the journal bearings as well as thrust bearings were inspected and their clearances were found to be within the acceptable limits.

Coupling between HP Air compressor and Gear box

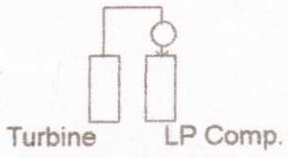
Distance between shaft ends	:	217.860 mm
Spacer Length	:	213.500 mm
Difference	:	4.360 mm
Design Prestrech	:	0.725 mm
Shim required	:	3.635 mm
Actual Shim provided (10 x 0.375 mm)	:	3.750 mm
Final Pre stretch after shimming	:	0.610 mm

101 J Train alignment final reading attached

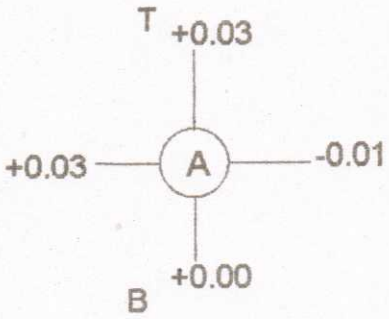
CODE NO JOB DESCRIPTION

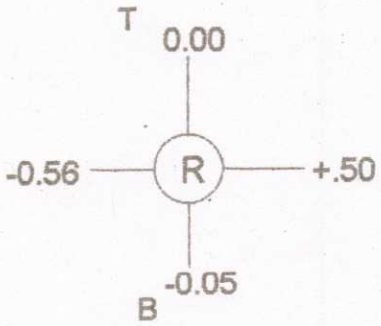
Alignment Readings of 101-J Train:

101 JT TO 101 JLP

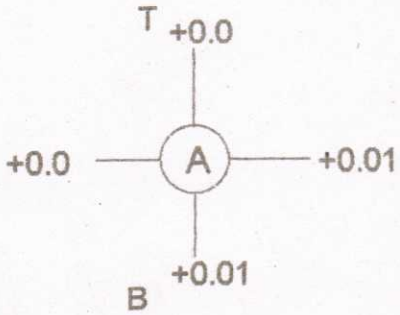


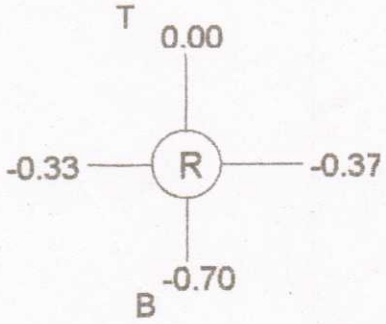
Before Correction





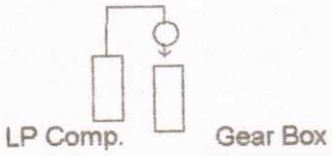
After Correction



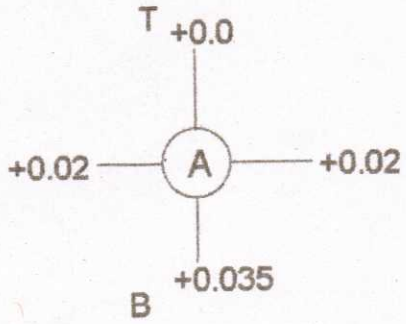


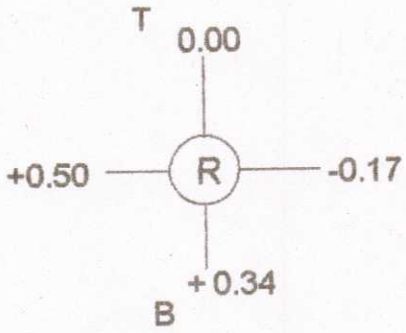
CODE NO	JOB DESCRIPTION

101 JLPTO GB

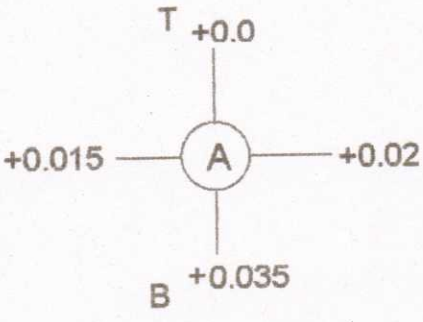


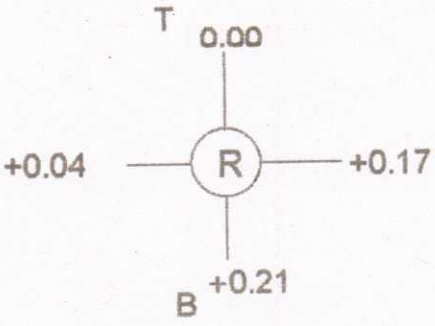
Before Correction





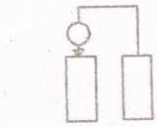
AfterCorrection





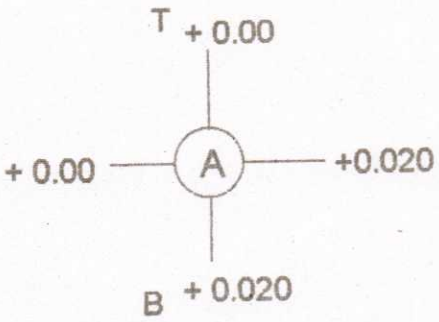
CODE NO JOB DESCRIPTION

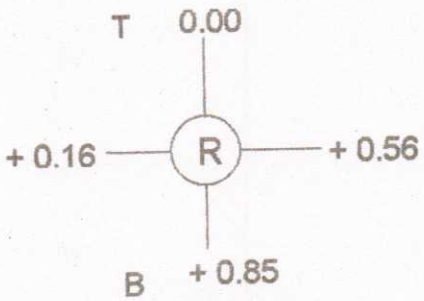
101 GB TO JHP



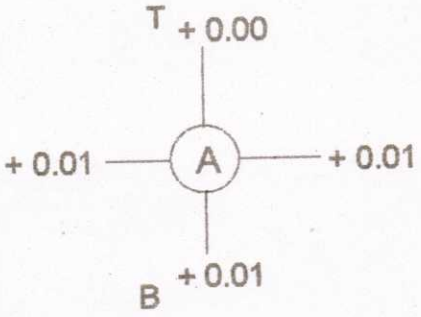
Gear Box HP Comp.

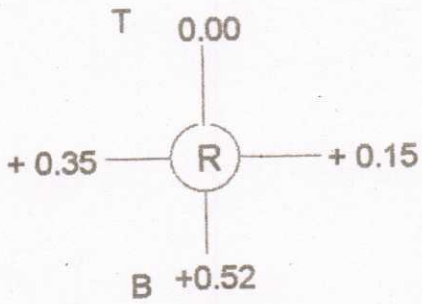
Before Correction





After Correction





CODE NO JOB DESCRIPTION

The readings taken during the preventive maintenance of 101-J train are recorded as under (All dimensions are in mm)

POSITION	RADIAL CLEARANCES		THRUST CLEARANCES	
DRIVE CONDENSING	DESIGN	ACTUAL	DESIGN	ACTUAL
Thrust end journal bearing	0.175-0.225	0.175	0.2-0.3	0.30
Opposite thrust end journal bearing	0.175-0.225	0.18		
L.P. COMPRESSOR (101-JLP)				
Thrust end journal bearing	0.15-0.20	0.20	0.275-0.375	0.36
Opposite thrust end journal bearing	0.15-0.20	0.20		
H.P. COMPRESSOR (101-JHP)				
Thrust end journal bearing	0.10-0.175	0.15	0.20-0.3	0.26
Opposite thrust end journal bearing	0.10-0.175	0.17		
GEAR BOX (101 JR)				
Drive gear North bearing	0.25-0.275	0.22	0.325	0.30
Drive gear South bearing	0.25-0.275	0.21		
Driven gear North bearing	0.25-0.275	0.21		
Driven gear South bearing	0.25-0.275	0.21		
Backlash of pinion gear		0.24		

CODE NO	JOB DESCRIPTION

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

N. G. Compressor Drive Turbine 102-JT Preventive Maintenance

Servomotors as well as pilot valves for HP, LP1 & LP2 were overhauled.

1. Governing oil filters were replaced.
2. Main lube oil filters were replaced (Silo side).
3. Turbine journal bearings at the coupling ends inspected and its clearances was found to be 0.22 which is more than maximum design value. Replaced with new pads after blue matching.
4. Turbine journal bearings at the thrust ends inspected and its clearances was found to be 0.15 mm which is more than the maximum design value. Replaced the bearing
5. Opened and cleaned the pads of thrust bearing. Axial float 0.21 mm which is with in the design value.
6. PG-PL Governor replaced with the reconditioned one.

N. G. Compressor 102J Preventive Maintenance

1) Coupling side the journal bearing opened , cleaned clearances noted to be with in the design value.
2) Thrust side journal bearing opened , found the tilting pads babbit damaged. The new pads were blue matched noted the clearances. The clearance is within design value and boxed up.
3) Thrust bearings opened , cleaned and noted the axial float which is found with in the design value.

Governor Drive Gear Box

Opened the gear box, cleaned all journal bearings, recorded all clearances and boxed up
102 J Train alignment reading is attached

CODE NO JOB DESCRIPTION

READINGS RECORDED DURING THE STROKE CHECKING OF GOVERNOR VALVE 102 JT

ZERO INJECTION

HP NOZZLE OIL PRESSURE (KG/CM^2)	OPENING MM	LP1 NOZZLE OIL PRESSURE (KG/CM^2)	OPENING MM	LP2 NOZZLE OIL PRESSURE (KG/CM^2)	OPENING MM
1.2	0	1	0	1.15	0
1.7	4	1.5	0	1.15	0
2	5	1.6	5	1.8	0
2.5	8	2.05	7	2.25	2.5
3	9.5	2.5	11.5	2.65	6
3.5	10.5	3	15	3.1	11
4	11.5	3.4	18	3.55	15
4.5	15	3.8	21	4	19
4.6	16	3.85	21.5	4	19
3.5	10	3.05	15	3.15	11
2.5	7.5	2.05	7.5	2.25	2.5
1.35	2.5	1.1	0	1.25	0
1.2	0	1	0	1.15	0

CODE NO JOB DESCRIPTION

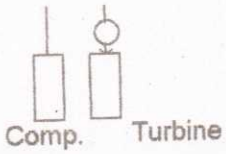
The reading taken during the preventive maintenance in 102J train are recorded as under (all readings are in mm)

POSITION	RADIAL CLEARANCES		THRUST CLEARANCES	
	DESIGN	ACTUAL	DESIGN	ACTUAL
DRIVE CONDENSING TURBINE (102-JT)				
Thrust end journal bearing	0.12-0.139	0.12	0.16-0.24	0.21
Opposite thrust end journal bearing	0.15-0.172	0.17		
Thrust end oil catcher		0.22		
Opposite thrust end oil catcher		0.17		
N.G COMPRESSOR (102-J)				
Thrust end journal bearing	0.07-0.095	0.080	0.25-0.35	0.30
Opposite thrust end journal bearing	0.07-0.095	0.075 to 0.080		
GOVERNOR DRIVE GEAR BOX				
Drive gear bearing Radial clearance (Governor side)	0.05	0.05		
Drive gear bearing Radial clearance (Turbine side)	0.05	0.05		
Driven gear bearing Radial clearance (Governor side)	0.05	0.05		
Driven gear bearing Radial clearance (Turbine side)	0.05	0.04		
Backlash of gear	0.10	0.08		

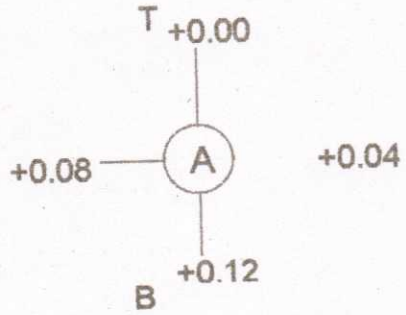
CODE NO JOB DESCRIPTION

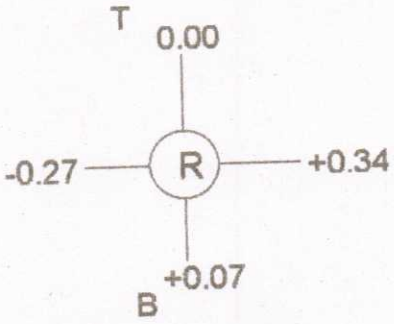
Alignment Readings of N. G. Compressor Train - 102J

102 J TO 102 JT

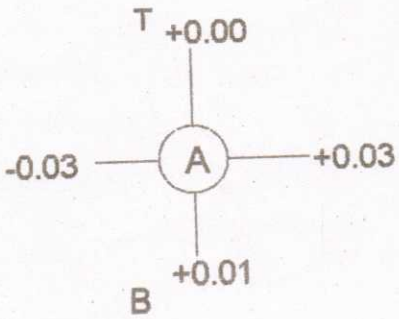


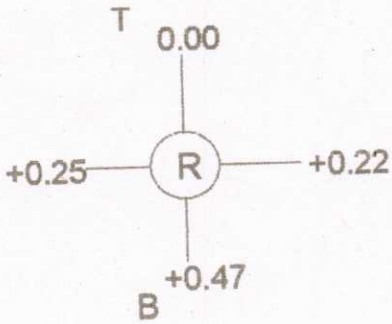
Before Correction





After Correction





CODE NO	JOB DESCRIPTION

01 01 03 SYNTHESIS GAS COMPRESSOR TRAIN :

Preventive Maintenance of Synthesis Gas Compressor Drive Turbine 103-JAT (Back Pressure Turbine) :

- Opened the thrust side journal bearing, cleaned , recorded the clearance and boxed up
- Opened the journal bearing at opposite thrust end cleaned , the clearance found more than the maximum design value. The old bearing pads replaced with new one after blue matching,, recorded the clearance and boxed up.
- Opened the thrust bearing, cleaned, axial float recorded and boxed up. Float found within limit .
- Coupling float was checked and found to be OK.
- Modified coupling guard bellow type fixed in between 103JAT & 103JLP to stop oil leakage. One flanged expansion bellow mounted in the coupling guard to take up the thermal expansion .
- Opened the inspection window of PRC 12 and checked the linkages.
- PRC 12 stroke was checked from control room DCS and found the stroke as per requirement
- New flanges 12" x 1500# WNRF provided at upstream of let down station MIC 22 , PIC 13 A/B for feasibility in Boiler hydrotesting. This modification eliminate the blinding of MIC 22 , PIC 13 A/B & 103-JAT steam inlet line which is not required to be hydrotested.. Steam blowing of 103JAT steam inlet line carried out by fixing vent pipe at the strainer flange.
- Greasing of Nozzle operating gear linkages was carried out.

Preventive Maintenance of 103-JBT (Condensing Turbine) :

- Opened the journal bearing at coupling end and thrust end, cleaned , recorded the clearance and boxed up. The clearances are found within the limit.
- Opened the thrust bearing, cleaned, recorded the float and boxed up. The float found with in the limit.
- 103JBT to 103JAT alignment checked and recorded.

Preventive Maintenance of 103-J LP Synthesis Gas Compressor :

Removed the couplings at both sides to access the removal of oil seal assembly for attending the leakage. Opened the journal Bearings, cleaned and recorded the clearance, found within limit. Seal assembly at intake end were opened, cleaned . White metal babbiting of inner floating ring at discharge end found damaged. Observed deep scoring on the babbit surface due to which the gas was leaking. Replaced the same with new one. Outer floating ring babbit found in good condition. Similarly intake end also cleaned and found the part in good condition and boxed up back. All 'O' rings were changed with new one. Boxed up the seal and bearings. Finally mounted the couplings on both side. Thrust float found 0.35 mm only which is less than the minimum design value, hence tracing paper of 0.05 mm thick fitted in the cover to have float of 0.40 mm.

CODE NO JOB DESCRIPTION

Preventive Maintenance of 103-J HP Synthesis Gas Compressor :

Opened opposite to thrust journal bearings, cleaned and recorded the clearance which is within the limit. Boxed up the bearing . Thrust side journal bearing clearance recorded by the help of dial gauge and recorded within the limit. Opened the thrust bearing pads at out side which is possible (removal of inner pad is possible only if thrust collar is removed). Checked the babbit surface cleaned recorded the float and boxed up.

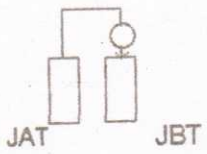
The readings taken during preventive maintenance of 103-J train for all machines in the train are recorded as under. All dimensions are in MM

POSITION	RADIAL CLEARANCES		THRUST CLEARANCES	
DRIVE CONDENSING TURBINE (103-JBT)	**DESIGN**	**ACTUAL**	**DESIGN**	**ACTUAL**
Thrust end journal bearing	0.25-0.3	0.20	0.2-0.3	0.24
Opposite thrust end journal bearing	0.25-0.3	0.20 new bearing housing		
BACK PR. TURBINE (103-JAT)				
Thrust end journal bearing	0.25-0.30	0.275	0.2-0.3	0.29
Opposite thrust end journal bearing	0.15-0.20	0.20 new bearing pads		
L.P. COMPRESSOR (103-JLP)				
Thrust end journal bearing	0.11-0.19	0.16	0.38-0.55	0.40
Opposite thrust end journal bearing	0.11-0.19	0.19		
H.P. COMPRESSOR (103-JHP)				
Thrust end journal bearing	0.11-0.19	0.14 recorded with dial gauge	0.38-0.55	0.41
Opposite thrust end journal bearing	0.11-0.19	0.16 Recorded with dial gauge		
103-JAT to JBT Coupling Float			5.45	5.45
103 JLP to JIIP Coupling Float			7.0	7.0

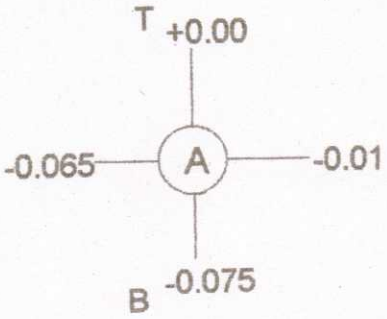
CODE NO JOB DESCRIPTION

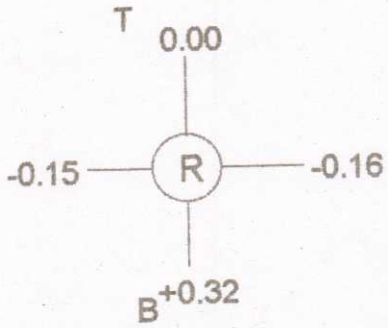
103 J Syn Gas Compressor Train

103-JAT TO JBT

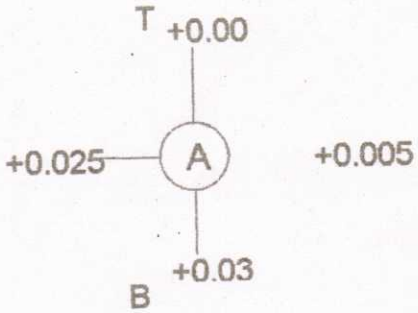


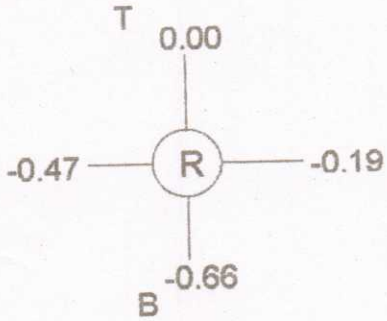
Before Correction





After Correction

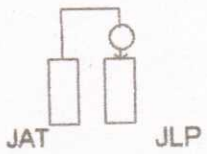




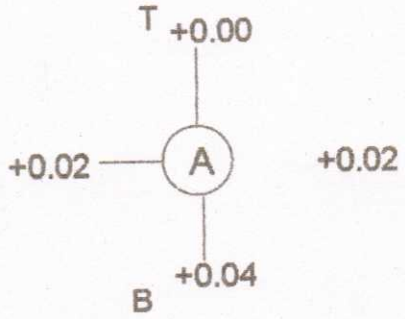
CODE NO JOB DESCRIPTION

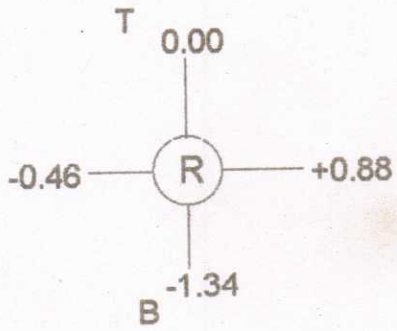
Alingment Reading of 103-J Train

103 JAT TO JLP

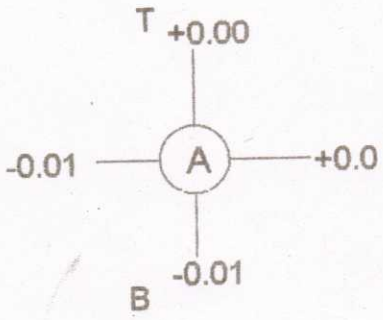


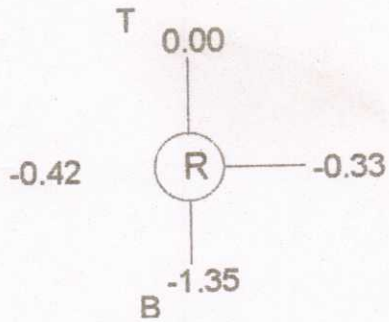
Before Correction





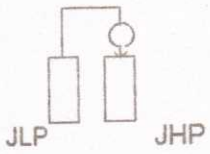
After Correction



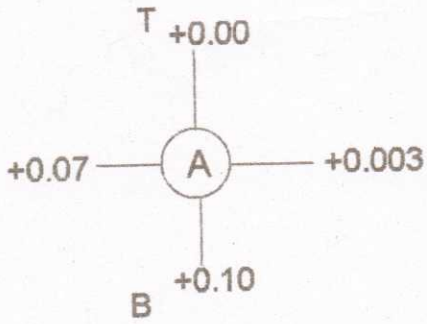


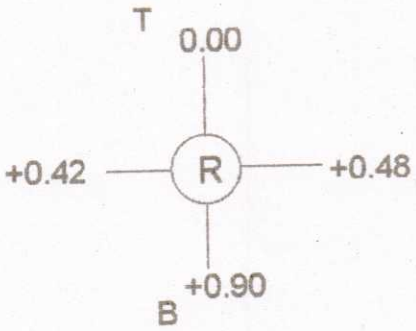
CODE NO	JOB DESCRIPTION

103 JLP TO JHP

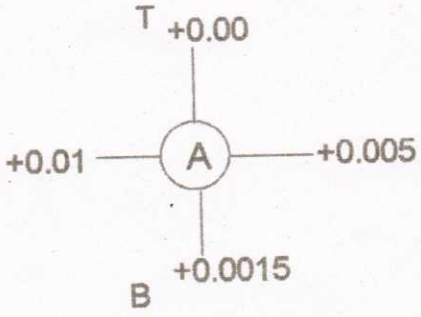


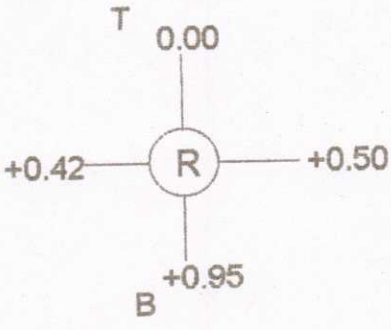
Before Correction





After Correction





CODE NO	JOB DESCRIPTION

01 01 04 REFRIGERATION COMPRESSOR TRAIN

Preventive Maintenance of 105-JT Refrigeration Drive Turbine :

- Both the journal bearings as well as thrust bearing were inspected
- Opposite thrust end journal bearing clearances were at higher side and same was replaced by new one.
- Steam chest end cover flange opened to attend steam leakage.
- Greasing of nozzle operating gear linkages was carried out.

Preventive Maintenance of 105-J LP Refrigeration Compressor :

- Decoupled both the couplings between turbine and LP case.
- Inlet side journal bearing clearances were recorded by dial gauge since it is single piece design
- Journal bearing at thrust end also similarly checked and recorded the clearance by dial gauge
- Opened the thrust bearing, cleaned, recorded the float and boxed up. Float recorded within the limit
- Both the sour oil traps were cleaned.

105-JR Gear Box Preventive Maintenance

- Decoupled the coupling between gear box and HP compressor
- All the journal bearings were inspected and found to be O.K.
- Gear and Pinion were inspected and found to be O.K.

Preventive Maintenance of 105-J HP Refrigeration Compressor :

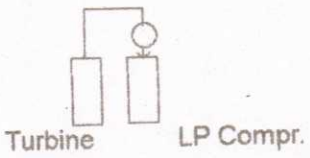
- Opened both side journal bearing, cleaned, clearances recorded found within the limit.
- Opened the thrust bearing, cleaned, recorded the clearance found within the limit. Axial float recorded as normal.
- Both the sour oil traps were cleaned.

Train alignment reading attached

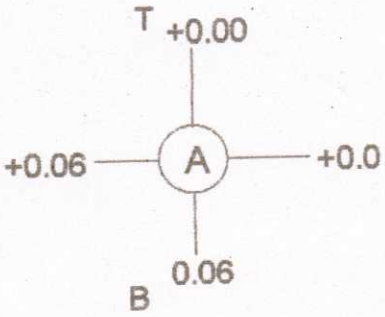
CODE NO JOB DESCRIPTION

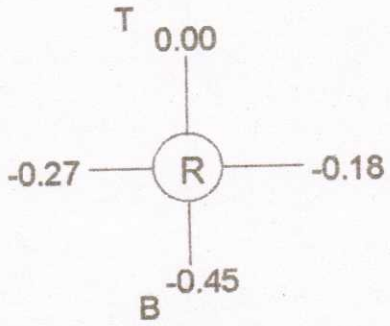
Alignment Readings of Refrigeration Compressor Train - 105J

105 JT TO JLP

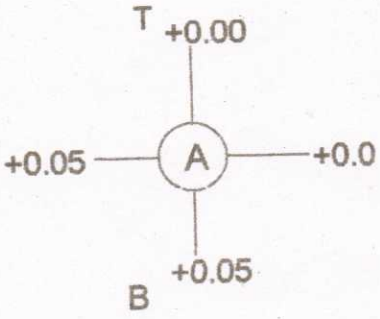


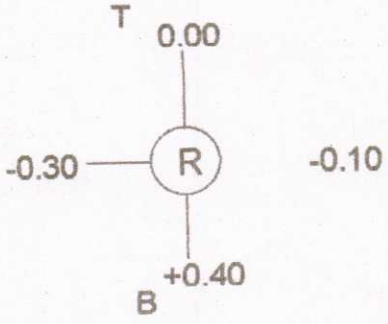
Before Correction





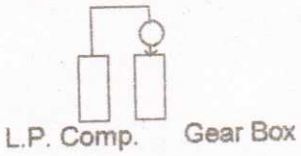
After Correction



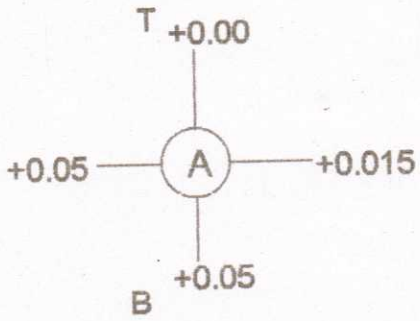


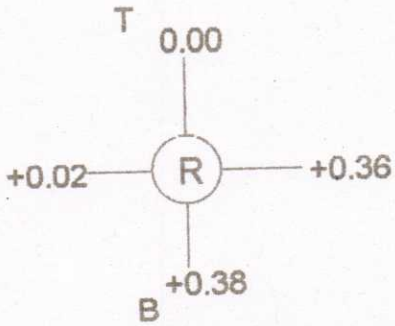
CODE NO	JOB DESCRIPTION

105 JLP TO G/B

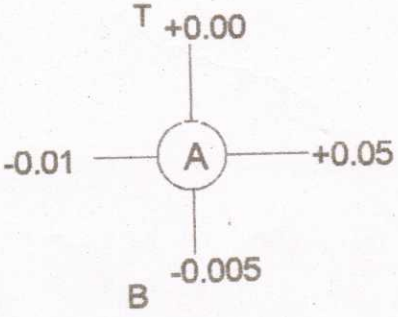


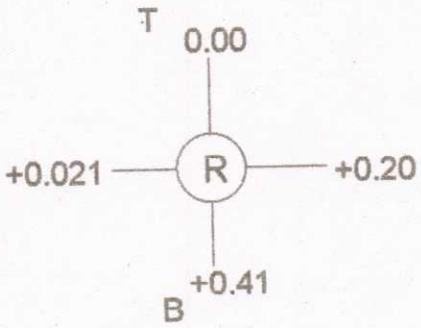
Before Correction





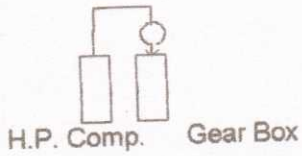
After Correction



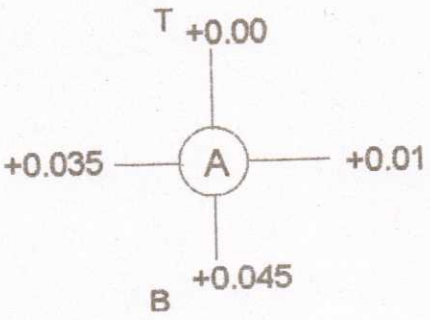


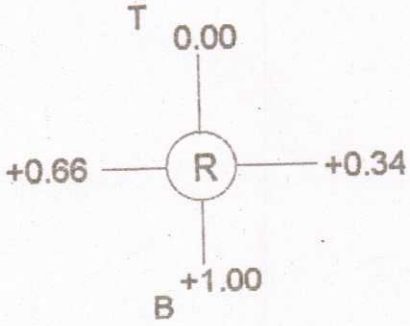
CODE NO JOB DESCRIPTION

105 JHP TO G/B

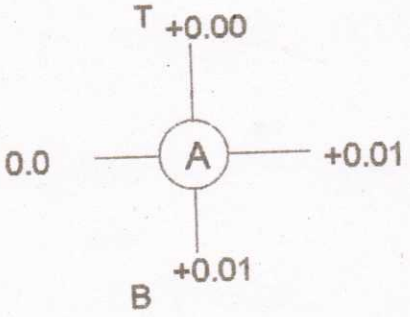


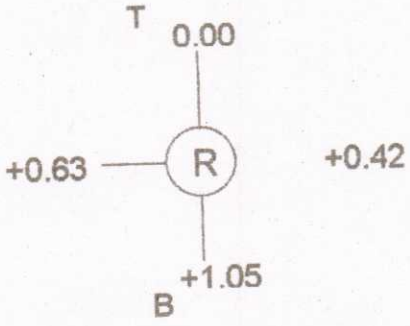
Before Correction





After Correction





CODE NO JOB DESCRIPTION

The reading taken during preventive maintenance of all the machines of 105J train are recorded as under. All dimensions are in MM.

POSITION	RADIAL CLEARANCES		THRUST CLEARANCES	
	DESIGN	ACTUAL	DESIGN	ACTUAL
DRIVE CONDENSING TURBINE (105-JT)				
Thrust end journal bearing	0.175-0.225	0.20 New bearing pads	0.2-0.3	0.25
Opposite thrust end journal bearing	0.175-0.225	0.21		
Coupling free float		5.06		
L.P. COMPRESSOR (105-JLP)				
Thrust end journal bearing	0.15-0.20	0.21 Dial G. Reading	0.275-0.375	0.33
Opposite thrust end journal bearing	0.15-0.20	0.20 Dial G. Reading		
Coupling free float Between LP to G/B		9.11		
GEAR BOX				
Thrust end journal bearing (Pinion)	0.25-0.30	0.36		
Opposite thrust end journal bearing (Pinion)	0.25-0.30	0.33		
Thrust end journal bearing (Gear)	0.25-0.275	0.28	0.35	0.33
Opposite thrust end journal bearing (Gear) Back lash	0.25-0.275	0.45 0.20		
H.P. COMPRESSOR 105 HP				
Thrust end journal bearing	0.10-0.175	0.19 Dial G. Reading	0.225-0.325	0.275
Opposite thrust end journal bearing	0.10-0.175	0.19 Dial G. Reading		

CODE NO	JOB DESCRIPTION

01 01 05 **N.G. BOOSTER COMPRESSOR TRAIN :**

Preventive Maintenance of N.G Booster Compressor Drive Turbine 800-JT :

- De-coupled the Turbine from N.G. Compressor
- Opened the front end and rear end journal bearing, cleaned, recorded clearance, found normal.
- Governing oil filter replaced
- Governing valve servo cylinder overhauled
- Governing valve stroke w.r.t secondary oil pressure checked from 505 Governor found normal

Preventive Maintenance of 800-J N.G Booster Compressor :

- Decoupled the N. G compressor from A.G. compressor.
- Opened the front end and rear end journal bearings, cleaned, recorded the clearance as normal
- Opened the thrust bearing, cleaned, recorded the axial float and boxed up.

Preventive Maintenance of 800-J A.G.Compressor

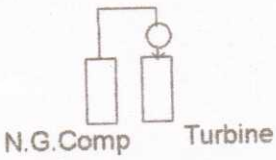
- Opened the journal bearings thrust end and opposite to thrust end, cleaned, recorded the clearance which are within the limit.
- Opened the thrust bearing, cleaned, recorded the axial float and boxed up.

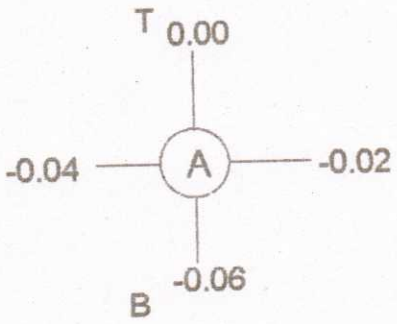
Train alignment reading attached

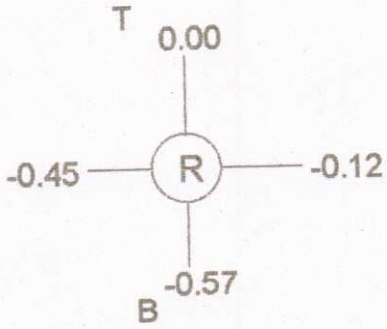
CODE NO JOB DESCRIPTION

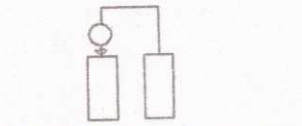
Alignment Readings - 800 - J of NG Booster Compressor Train

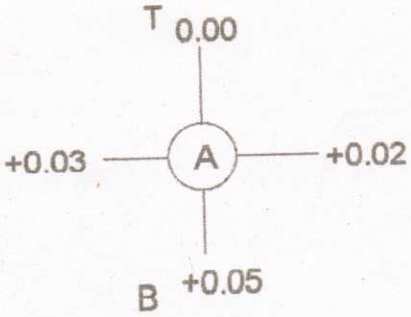
800 JNG TO 800JT

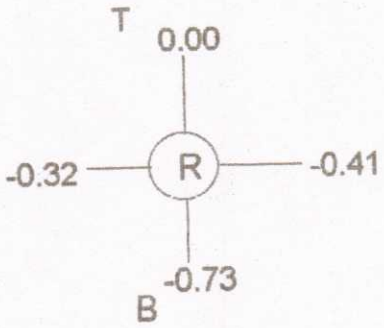












CODE NO JOB DESCRIPTION

The reading taken during preventive maintenance of all the machines in 800J train is recorded as under. All dimensions in MM.

POSITION	RADIAL CLEARANCES		THRUST CLEARANCES	
	DESIGN	ACTUAL	DESIGN	ACTUAL
DRIVE CONDENSING TURBINE 800JT				
Thrust end journal bearing	0.15-0.21	0.18	0.16-0.24	0.18
Opposite thrust end journal bearing	0.15-0.20	0.17		
Thrust end oil catcher		0.15		
Opposite thrust end oil catcher		0.15		
N.G. COMPRESSOR 800J NG				
Thrust end journal bearing	0.08-0.113	0.10	0.25-0.35	0.30
Opposite thrust end journal bearing	0.08-0.113	0.10		
A.G. COMPRESSOR 800J AG				
Thrust end journal bearing	0.08-0.113	0.11	0.20-0.30	0.28
Opposite thrust end journal bearing	0.08-0.113	0.10		

CODE NO	JOB DESCRIPTION

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

104-JAT BFW Pump Drive Turbine (Terry) Overhauling :

Turbine was opened for recording details of internal like diaphragms and sealing etc. for reverse engineering of the diaphragms which are ordered on M/S Triveni Engg. Banglore.

Following jobs carried out during this event :

- De-coupled the turbine from the pump
- Turbine top casing opened.
- Rotor was taken out for checking the internals.
- Removed the diaphragms from the casing and handed over to M/S. Treveni Engineering for recording the details for reverse engineering.
- Scoring at gland sealing area in the rotor found beyond the limit (this gland was leaking during running of the turbine).
- After cleaning the casing grooves Bottom diaphragm halves inserted in the casing
- Replaced the rotor with reconditioned one.
- New carbon rings were fitted at both glands and recorded the clearances found with in design value
- Thrust pads were replaced by new one since the axial float is more than the maximum value.
- Journal bearing at both end were opened, cleaned, recorded the clearances found with in limit
- Top casing half with the same diaphragm boxed up
- Turbine OST done at 4120 RPM

Governor Tested on Test Bench :

104 JAT Governor		Speed at Power Piston actuate
Air Signal	3 PSI 15 PSI	349 900
Manual Knob		345 899

CODE NO	JOB DESCRIPTION

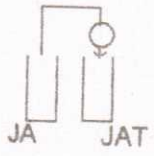
New orifice flange provided in steam inlet line to measure steam flow into 104-JAT turbine .

104 -JA BFW Pump Preventive Maintenance

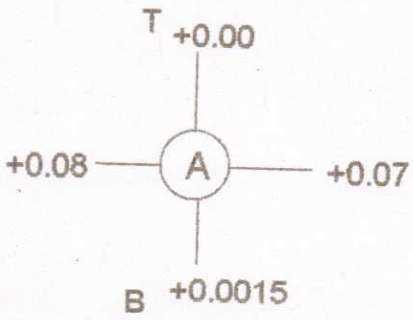
Both the journal bearings as well as thrust bearing were inspected and found to be OK
Deep scoring noticed on the babbit surface of thrust pads and float also found excess, hence replaced by new one. Axial float recorded OK.
ARV-NRV attended for passing . Replaced the 'O' rings
MOP checked and found OK.
Pump & Turbine coolers cleaned
MOP & AOP strainer and filters were cleaned.
Alignment recorded readings attached
Coupled and greased the coupling.
Alignment recorded attached

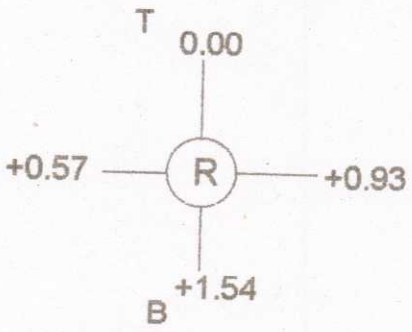
CODE NO JOB DESCRIPTION

Alingment Reading Of 104 JAT Terry Turbine drive BFW Pump

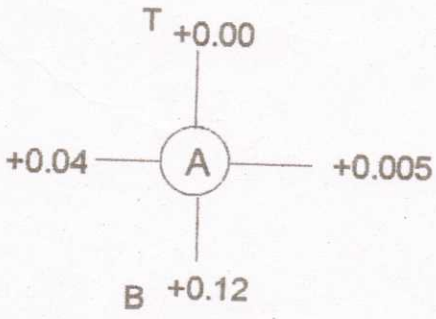


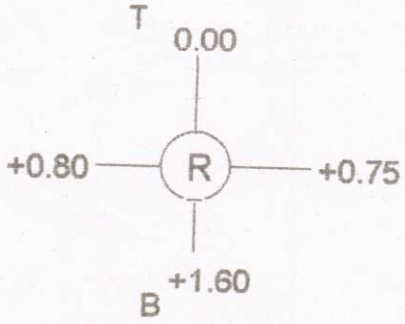
Before Correction





After Correction





CODE NO JOB DESCRIPTION

Preventive Maintenance of 104-JT BFW Pump Drive Turbine (Elliot)

- De-coupled the Turbine from Pump
- Opened both the journal bearings, cleaned, recorded the clearance
- Thrust bearing deep ball bearing found in good condition (No Excessive play)
- Turbine hand nozzle valve bonnet steam leakage attended.
- Oil filters and strainer cleaned and boxed up.
- AOP alignment corrected.
- Governor oil flushed and tested on Governor test bench

Governor Tested on Test Bench :

104 JT Governor		Speed at Power Piston Actuate
Air Signal	3 PSI 15 PSI	355 924
Manual Knob		341 923

Preventive Maintenance of 104-J BFW Pump :

- Both the journal bearings as well as thrust bearing were inspected and found to be OK
- Thrust bearing pads found in good condition which are cleaned and boxed up. Float found OK. MOP checked and found OK.
- Pump & Turbine coolers cleaned
- MOP & AOP strainer and filters were cleaned.
- Alignment recorded readings attached
- Coupled and greased the coupling.

Alignment recorded attached

CODE NO JOB DESCRIPTION

The reading taken during maintenance of 104J A Train are recorded as under:
All dimensions in inches

POSITION	RADIAL CLEARANCES		THRUST CLEARANCES	
	DESIGN	ACTUAL	DESIGN	ACTUAL
BFW DRIVE TURBINE 104JAT				
Thrust end Journal Brg.	0.005- 0.007	0.005-0.006	0.011-0.016	0.013
Opposite thrust end journal bearing	0.004- 0.007	0.005-0.006		
Carbon Ring clearance at opposite thrust end(4 nos.)	0.004- 0.007	0.004		
Carbon Ring clearance at thrust end(4 nos.)	0.007- 0.010	0.007		
Nozzle ring to first wheel of rotor clearance		0.062		
BFW PUMP 104JA				
Thrust end Journal Brg.	0.006- 0.008	0.006-0.007	0.014	0.013
Opp. Thrust End Brg.	0.006- 0.008	0.006-0.007		
BFW DRIVE TURBINE 104JT				
Thrust End Journal Brg	0.007 -0.010	0.010		0.016
Opp. Thrust End Journal Brg	0.007- 0.010	0.009		
BFW PUMP 104J				
Thrust End Journal Brg	0.006- 0.008	0.007		
Opp. Thrust End Journal Brg	0.006- 0.008	0.008	0.014	0.013

CODE NO	JOB DESCRIPTION

01 02 02 **107-JT aMDEA Pump Drive Turbine (Elliot) Overhauling**

- Decoupled the coupling
- Opened the turbine casing .
- Removed Rotor , carbon rings.
- Cleaned the internals and rotor
- Gland carbon found to be worn excessively
- Assembled with same rotor with new carbon rings at the glands and noted the clearances.
- Thrust ball bearing replaced by new one SKF -6310
- Journal bearing (Thin shell type) at both end were opened and found to be OK.
- Alignment checked and corrected.
- Turbine OST done at 4120 RPM OST trip pin gap was measured 0.040"
- The exhaust valve of the turbine (Butterfly type Imported). Vennesa Triple offset design with metal to metal seat, torque seated was opened by representative of M/S Keystone to attend passing of the valve After dismantling valve sealing surface lapped and replaced by new sealing gasket and checked by Pneumatic air upto 6 Kg found minor leakage from sealing surface.
- Sealing steam tubing got damaged and same was replaced by new one and RV on sealing line reported passing . Reconditioned the same RV and tested.

Preventive Maintenance of 107-JAT aMDEA Pump Drive Turbine (MURRAY) :

Both the journal bearings opened, inspected and boxed up as were found O.K
Readings recorded during the maintenance of 107J train. All are in inch

POSITION	RADIAL CLEARANCES		THRUST CLEARANCES	
	DESIGN	ACTUAL	DESIGN	ACTUAL
Elliot Turbine 107JAT				
Thrust End Journal Brg	0.007 - 0.010	0.008 - 0.009		
Opp. Thrust End Journal Brg.	0.007 - 0.010	0.007 - 0.009		
Carbon Packing ring inner most at both end	0.001 - 0.0035	0.003		
Carbon Packing ring outer most at both end	0.001 - 0.0035	0.002		
Nozzle clearance measured with filler gage				0.102
Stationary segment (Diaphragm) to second blade shroud clearance :				0.139
Murray Turbine 107 JT				
Thrust end Journal Brg.	0.008 - 0.010	0.009 - 0.010		0.008
Opp. Thrust End Brg.	0.006 - 0.008	0.006		

CODE NO	JOB DESCRIPTION

01 02 03 **D. M. Water Pump Drive Turbine 2004-JT Overhauling :**

- De-coupled the turbine from Pump
- Turbine was taken for major overhauling due to high vibration analysed as unbalance of the rotor.
- During the overhauling the rotor was replaced with dynamically balanced one.
- Both side bearing replaced by new one.
- Governor side -6306 SKF
- Pump side -6307 SKF
- Nozzle clearance :
- Turbine axial float : 0.13 mm
- New carbon Packing provided at both side (clearance 0.002" to 0.003")
- Alignment checked and corrected
- OST done at 3700 RPM
- Suction strainer was also cleaned.
- Coupled.

01 02 04 **102 JLT Lube oil Pump Drive Turbine & 102 JST Seal oil Pump Drive Turbine**

- De-coupled the turbine from pump. Overhauling of the governor valves, trip assembly and oil flushing of TG-10 governor done in both turbines.
- Alignment checked and coupled.

01 02 05 **101/105 JLT Lube oil Pump Drive Turbine Overhauling :**

- De-coupled turbine from the pump.
- Removed the coupling hub and carbon packing
- Both bearings were replaced by new one 7312 BECBM/6308 SKF
- Provided new Carbon packing ring clearance :0.002" to 0.003"
- Nozzle clearance recorded as
- Turbine axial float after final assembly recorded as 0.10 mm
- Pump axial float recorded as 1.85 mm
- Coupling gap between pump and turbine : 0.286"
- Pilot valve clearance with trip lever recorded as 0.018"
- Governor oil flushed
- Mounted the turbine and OST carried out.
- Coupled

47

CODE NO	JOB DESCRIPTION

01 02 06 **103-JLOT/SOT Lube oil Pump Drive and Seal oil Pump Drive Turbine Overhauling**

- De-coupled the turbine from the pumps.
- Removed the couplings and carbon packing.
- Overhauling of governor valve, trip assembly and flushing of governor TG-10 done.
- Both bearings were replaced by new one 6310/6309C3 SKF
- Provided new Carbon packing ring and clearance recorded as 0.002" to 0.003" in each ring
- Nozzle clearance
- Pilot valve clearance with trip lever recorded as 0.031"
- Mounted the coupling hub and OST carried out.
- Alignment checked at both end and corrected. Coupled

01 03 01 **I. D. FAN TRAIN :**

Preventive Maintenance of 101 BJT I.D. Fan Drive Turbine (Elliot) :

- Decoupled the coupling between turbine and gearbox
- Journal bearing at coupling end clearance was found at higher side same was replaced with new one.
- Governor side journal bearing checked and found to be OK.
- Grid coupling teeth found broken and the coupling was replaced by new one.
- Dimensional details of the turbine and gear box coupling shaft
- Turbine shaft OD : 61.71 mm dia
- Coupling Hub ID : 61.70 mm dia
- Pinion Shaft OD : 80.99 mm dia
- Coupling Hub ID : 80.95 mm dia

GOVERNOR ONLINE TESTING WAS CARRIED OUT IN UNCOUPLED CONDITION AND THE READINGS AS FOLLOWS :

Air Signal %	Speed (RPM)
100	1760
90	1990
80	2240
70	2460
60	2700
50	2960
40	3488
30	3,760
20	4,060
10	4,170
0	4,170

CODE NO JOB DESCRIPTION

Preventive Maintenance of ID Fan Gear Box :

- De-coupled the gear box from the fan
- Opened the gear box cover. All the bearings were inspected and their clearances were found to be O.K.
- The condition of both the Gear as well as Pinion were found to be O.K.

Preventive Maintenance of 101-BJ I.D. Fan :

Both the bearings of the I.D. Fan were inspected and found to be OK.

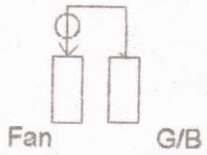
The reading taken during overhauling of I.D. Fan Train are recorded as under.
All are in MM

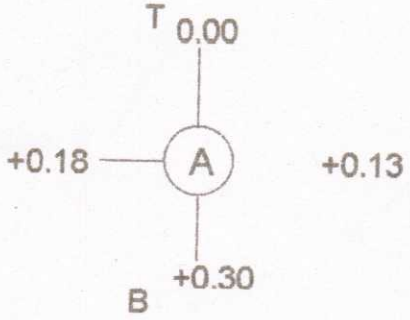
POSITION	RADIAL CLEARANCES		THRUST CLEARANCES	
	DESIGN	ACTUAL	DESIGN	ACTUAL
TURBINE 101BJT				
Front bearing	0.15 - 0.225	0.17		
Rear bearing Coupling side	0.15 - 0.225	0.20		
GEAR BOX				
Pinion front bearing	0.275	0.26		
Pinion rear bearing	0.30	0.25		
Gear front bearing	0.25	0.25	0.35	0.39
Gear rear bearing	0.275	0.26		
Pinion Gear backlash		0.22		
I.D. FAN 101BJ				
Front bearing Coupling end	0.2 - 0.30	0.28		0.85
Rear bearing	0.2 - 0.30	0.27		

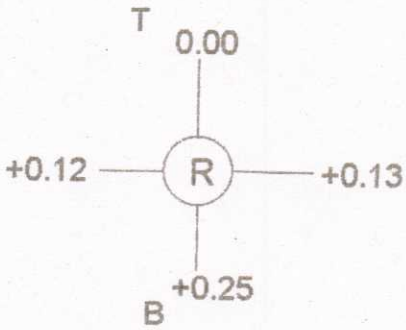
CODE NO JOB DESCRIPTION

Alignment Readings of I.D. Fan - 101-BJ
Final alignment Reading

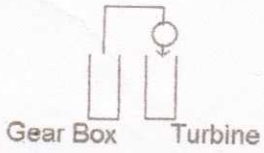
G/B TO FAN

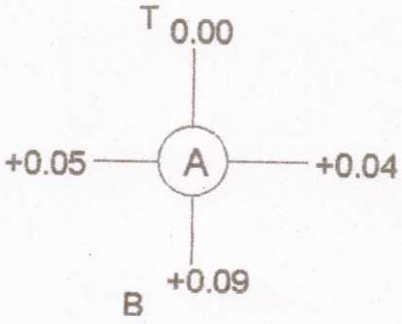


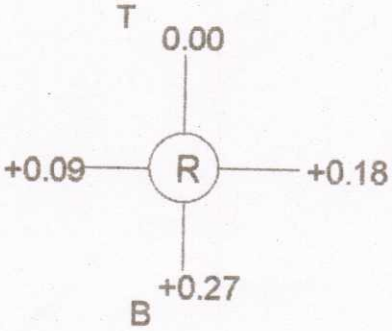




GEAR BOX TO TURBINE







CODE NO	JOB DESCRIPTION

01 12 01 PRIMARY REFORMER - 101-B :

Pent House and Radiant Zone :

Reformer radiant zone man way was opened after cooling for ultrasonic scanning of catalyst tubes.

Following maintenance jobs were carried out.

1) Reformer tube top plug were opened as per Production requirement for Catalyst changing in 309 626, 627 and 628 tubes in which continuos hot bends were observed during the running.
2) Arch burner blocks were inspected and 16 nos. were found in damaged condition and the same were replaced by new burner blocks. (store code 100105010)
3) Bottom header insulation in damaged areas was repaired by new insulation blanket and wet felt ceramic fiber .
4) Damaged Roof insulation was repaired with new module and insulation blanket.

1) Naphtha ball valve replaced by new one in following burner which were reported passing
2) 610,114,507,804 &810
3) Steam valve of burner no. 804 replaced by new one

Primary reformer West wall panel repair :

Repairing of the west wall where hot noticed during the operation of the plant was carried out near burner no. 114. Removed the old brick lined refractory, cut out the CS panel plate 3 x 3 Metre. Welded new CS Plate of 8 mm thick.. Welded clamp washer for brick support. Relining of brick wall refractory bricks provided by Civil Department.

HT Convection Zone :

Primary reformer HT convection zone protective sheet was badly damaged. (Insp. Report April 1999 Shutdown). The same was replaced by ceramic fibre insulation (5 ½ " thk) and incoloy 800H sheet of 0.5 mm thk. This job was carried out by M/S Lloyd Insulation (I) Ltd. Total 38 sq. Metre area relined during the shut down at the wall below the mixed feed coil.

Following spares were consumed :

Description	Store code
Incoloy 800 H sheet ,0.5 mm thk	456402016
Inconel 600 stud 3/8 " X 6 " long	100107050
Inconel 600 nut 3/8 " dia	100107055
Inconel washer 600 1" sq X ½ " dia hole X 1/8 " thk	100107060

CODE NO JOB DESCRIPTION

01 12 02 **WASTE HEAT BOILER 101-CA & CB :**

Waste heat boiler 101 C A & B was opened for replacement of distributor and liner and also to attend BFW leakage at tube bundle flange of 101 CA.

101 CA Waste Heat Boiler :

Opening of studs of following joints were started on 21 st March 2002 08:00 hrs. Opening and box up both waste heat boiler was carried out by M/S Mahavir Engg. Baroda

1. Water inlet flange
2. Steam outlet flange -2 nos.
3. Steam side channel flange
4. Gas side channel flange

Lifting of tube bundle was started on 25th. March 10:00 hrs and completed same day at 17:00 hrs. Total time taken was 7 hrs. After removal of tube bundle shell liner was inspected and following damages were observed. (Ref Fig. 1)

Removed tube bundle outer tube material T 1 and there is damage in the bundle parts like buffles , tie rods due to which it cannot be reused with out repair.

1) Distributor found bulged
2) 2nd liner from top found bulged below weld joint
3) 3rd liner found shifted by one inch from its overlap. Refractory was not exposed.
4) Bottom liner had got distorted.
5) Distributor end plate found bulged and touching shell liner.
6) After cutting and removing of distributor, transfer line from 103-D to waste heat boiler was inspected. Thermowell in transfer line found bent. Transfer line liner found bulged at 102-C side.

CODE NO	JOB DESCRIPTION

Repair job of liner started on 27th. 23:00 hrs. and following jobs were carried out by M/S Skywin erectors Ahmedabad : Ref Fig 1,2,3 & 4

1) Shell liner was cut and removed below the weld joint.Bottom liner and bottom plate was cut and removed.
2) Drain line pipe was removed.
3) Transfer line was cut and removed upto support on 101 CA side.
4) Refractory lining at bottom done by Tabcast 97 L.Refractory mixing temperature maintained 20-25deg C.
5) Welding of bottom plate ,drain line and shell liner segment 1 & 2 were carried out. Keeping cylindrical wall liner at bottom 1& 2 as shuttering, wall refractory behind liner was carried out with Tabcast 97L.
6) Thermowell was made straight. Refractory was done behind transition piece and transition piece was welded.
7) Third segment of line was welded.Pockets were provided for refractory filling.
8) Refractory filling was done and patch plates were welded.

1. Segment 4 was welded.
2. Distributor provided with min clearence of 1 ¾ " between end of distributor and shell liner.
3. Saddle support of distributor was welded.

Box up of bundle was started on 05.04.2002 at 10:00 hrs. and completed by 06.04.20002 at 17:00 hrs New tube bundle outer tube material T11.

Transition liner between 101 CA and 103-D :

The end plug of 103-D was opened and transition liner was inspected .It was found that refractory has got exposed in about 6-8 " length on complete circumference at about 2 m distance from 103-D end.

Following repair jobs were carried out : (Ref FIG-5)

1. Bulged portion of second liner from 103-D end was ground and removed.
2. Insert new ring liner of 4" width was placed below the second liner.
3. A new piece of 10" width was welded to liner no 1 and the insert piece.

50

CODE NO	JOB DESCRIPTION

101 CB Waste Heat Boiler :

Opening of studs of following joints were started on 21 st March 2002 at 08:00 hrs.

1. Water inlet flange
2. Steam outlet flange -2 nos.
3. Steam side channel flange and
4. Gas side channel flange
5. Lifting of tube bundle was started on 26th. at 08:30 hrs and completed by 15:30 hrs.Total time taken was 7 hrs.After removal of tube bundle shell liner was inspected and following damages were observed. Ref FIG

1. Distributor found bulged
2. Bottom liner has got bulged badly.
3. 5th liner from top shifted down by about 5 " and refractory got exposed
4. Also bottom portion of 5th liner has got bulged.
5. Distributor end plate found bulged and touching shell liner
6. After cutting and removing distributor, the transition piece was inspected.It was observed that transfer line from 103D to 101 CB liner found bulged near the opening.

REPAIR JOB OF LINER STARTED ON 27TH. AT 14:00 HRS.FOLLOWING JOBS WERE CARRIED OUT :

1. Fifth liner from top was cut just above the bulged portion and removed.
2. Bottom liner and plate was cut and removed.
3. Drain pipe was removed.
4. Casting below bottom plate was carried out.
5. Bottom plate and drain pipe was welded.
6. First shell liner segment from bottom was welded and then refractory beneath the segment was carried out.
7. Second shell liner segment was welded.
8. Transition piece was cut and removed upto support and refractory below transition piece was carried out.
9. Transition liner was welded.
10. Patch plates in the support of shell liner was cut and removed .Refractory filling done through this pockets.
11. Patch plates were welded.
12. Liner segment of 16 ¼ " welded to bottom of second liner.
13. Third liner from bottom was cut about 5 " from bottom and new segment was welded to it maintaining 2 ½ " gap between 2nd and 3rd liner.
14. It was observed that the refractory behind the 3 rd liner was removed about half portion around circumference .Hence 3 no. Pockets was cut and made for filling refractory.
15. After refractory filling welding of pocket was done.
16. Distributor provided with min clearence of 1 ¾ " between end of distributor and shell liner.
17. Saddle support of distributor was welded.

CODE NO JOB DESCRIPTION

After final inspection box up was started on 03.04.2002.

Box up of bundle was started on 05.04.2002 at 10:00 hrs. and completed by 06.04.20002 17:00 hrs.

Note : Details of crane used for lifting tube bundle are given below:

Manufacturer	:	American Corporation
Model	:	AmHoist 9310
Capacity	:	204 MT
Type	:	Crawler mounted lattice boom.

Crane was useful only to switch over the bundle from mono rail to bundle plateform. Lifting of bundle from the shell was not possible due to structure where waste heat exchanger is located. Tube bundle was lifted at 100 ' boom length. Incoloy 800 H Plate ,6 mm thk. -store code -456402025

Tube failure in 101-CA waste heat boiler :

During start up after annual Turnaround, on 15 th. April 2002, at 21:30 steam drum level was found decreasing and HTS inlet temperature reduced considerably.Water was coming from the drain of Waste heat boiler indicating tube leakage in one of the waste heat exchanger. Noticed continuous water draining from 101-CA bottom drain.

The plant was stopped immediately and it was decide to replace the tube bundle.Bolt Opening of studs of following joints were started on 16th April 2002 at 00:00 hrs.

1. Water inlet flange
2. Steam outlet flange -2 nos.
3. Steam side channel flange
4. Gas side channel flange

Bundle lifting was started at 06:00 hrs and kept on stand by 15:30 hrs.

Note : HM crane with 80' boom was used for shifting tube bundle.

It was decided to use the tube bundle removed from 101CA (outer tube T 11) after changing the water side gasket outer tube bundle.Bolt loosening of spare tube bundle started at 08:00 hrs on 16 th April 2002 and lifting was started on 17th at 19:00 hrs.The gasket area was cleaned and assembly started using new gasket on 18th at 14:30 hrs.Completed by 18:30 hrs.The tube bundle was lifted on 19th at 06:00 hrs and bolt tightening started by 15:00 hrs.The exchanger was handed over to production at 12:00 hrs. on 20 th April.

52

CODE NO JOB DESCRIPTION

After gas side pressure was developed to 30 Kg/cm^2 leakage was observed from gas side flange of both 101 C A & CB. As the leakage was not reduced after tightening of bolts of the joint furmenite filling of both joints was carried out.

Following are the tube bundle details which are installed during annual shut down March/April 2002

Eqpt. No.	Identification No.	Date of Installation	Outer Tube Material	Remarks
101-CA	1-72-04-31587-73	Mrch/April 2002	T 11	1-72-04-31587 - 73 was leaking BFW at T/S joint and replaced with (13515) 1-7104-31049-1 (T1) but tube leak immediately after start up, hence the BFW leak was attended and changed to 1-72-04-31587 - 73
101-CB	1-72-04-31184-72	Mrch/April 2002	T 11	1-72-04-31184-72 replaced (13517) 1-71-04-31049-2 (T 1)

Retubing of (13515) 1-7104-31049-1 shall be carried out departmentally. Tube T 1 shall be procured locally.

01 12 03 **AUXILIARY BOILER REPAIR JOB :**

- Auxiliary Boiler man way was opened and following jobs were carried out.
- Damaged refractory was repaired by Civil Deptt.
- Water wall Tube thickness was measured by Inspection deptt and also tube deflection was measure Tube external cleaning was done.
- Damaged refractory of Front wall and west wall side at roof side near water wall tube D/E was
- Repaired.

CODE NO JOB DESCRIPTION

01 13 01 HEAT EXCHANGERS AND COOLERS HYDROJET CLEANING :

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

Sr. No.	Equipment	Qty. Nos.	No. of Tubes	Tube side		Shell side		Hydrojetting
				Design Pr. Kg/cm²	Hydrotest Kg/cm²	Design Pr Kg/cm²	Hydrotest Kg/cm²	
1	109 C2A / C2B	2	1150	30.580	46.50	5.29	8.0	Tube/Shell
2	109 C1A / C1B	2	1150	30.580	46.50	5.29	8.0	Tube/Shell
3	115 C	1	649 U	29.90	-	10.60	16.0	Shell
4	124 C	1	775 U	1580	-	17.60	27.0	Shell
5	116 C	1	300 U	66.40	-	5.29	8.0	Shell
6	129 JC	1	290 U	2.30	-	5.29	8.0	Shell
7	131 JC	1	348 U	13.15	-	5.27	8.10	Shell

(II) Following heat exchangers & coolers were opened & boxed up after hydrojetting from tube side. Exchangers were also hydrotested after assembly.

Sr. No.	Equipment	Qty. Nos.	No. of Tubes	Tube side		Shell side		Hydrojetting
				Design Pr. Kg/cm²	Hydrotest Kg/cm²	Design Pr Kg/cm²	Hydrotest Kg/cm²	
1	105 CA	1	2790	05.27	Static	30.9	46.50	Tube
2	105CB	1	2790	5.270	Static	30.9	46.50	Tube
3	108 C1A /C2A	2	1415	05.27	8.10	08.00	-	Tube
4	108 C1B / C2B	2	1415	05.27	8.10	08.00	-	Tube
5	110 CA/CB	2	763	05.60	-	05.27	08.10	Tube
6	111 CA/CB	2	2790	05.27	Static	05.27	08.10	Tube
7	127 CA/CB	2	3516	05.6	-	21.1	31.50	Retubed from C to SS 304L
8	128-C	1	1200	05.60	-	08.09	12.50	Retubed from C to SS 304L
9	130 JC	1	264	05.82	-	05.27	08.10	Tube
10	173 C	1	294	10.60	-	05.27	08.10	Tube
11	802 C	1	462	07.00	-	18.00	27.00	Tube
12	803 C	1	264					Retubed from C to SS 304L

CODE NO	JOB DESCRIPTION

(A) **Retubing of Refrigerant condenser 127 CA/CB :**

More than 500 tube were leaking during running plant and plugged mainly at bottom side of both exchanger. Cause of the leakage was analysed as Biological growth in cooling water which attack CS tube in service. So it was proposed to retube with S S 304L seamless cold drawn tubes as per ASTM A-213 TP 304L of the size of 3/4" OD x16 SWG x7315 mm(old tube 3/4"OD x 7315mm x 14 SWG material A-179). Solution annealed,stress relieved tube against MPR 12/00602 from M/S.Ratnamani Tube Chhatral Total 7200 Nos.). Retubing job was awarded to M/S NIGASU Engineering Works Bombay against MPR 12/00603 . Job was carried out within 14 days.

(B) **Retubing of 128 C :**

More than 50 tubes were leaking during running plant and plugged . Causes of leakage was similar as 127-C . Procured the S S seamless Cold Drawn tubes as per ASTM A-213 TP 304L of the size of 3/4" OD x 16 SWG x6096 mm (old tube 3/4"OD x 14 SWG x 6096mm A-179) procured from M/S.Choksi Tube and retubing job awarded to M/S. Patel Air Temp.

(III) **Following Lube Oil Coolers were opened for Hydrojetting :**

a) 101-JLC / 1-2 & 3 - Lube oil cooler for 101 - J - 3no.s

b) 102-JLC/ 1 & 2 - Lubc oil cooler for 102 - J - 2no.s

c) 103-JLC/ 1 & 2 - Lube oil cooler for 103 - J - 2no.s

d) 800-JLC/ 1 & 2 - Lube oil cooler for 800 - J - 2no.s

(IV) **Following Lube Oil Ccoolers were opened, cleaned by rod poking and boxed up:**

a) 101-BJ Lube oil cooler - 3 nos.
b) 104-J / JA Lube oil cooler - 5 nos.
c) 107-J / JA Lube oil cooler - 2 nos.

CODE NO JOB DESCRIPTION

(V) **Following gland condensors, Surface condenser were opened, cleaned by Hydrojetting and boxed up:**

a) 101- JCA / JCB Surface Condensor. - 2 nos.
b) 101-JCA I /A Condenser. - 2 nos.
c) 101-JCB I / A Condeser. - 1 no.
d) 101-JT Gland Condensor. - 1 no.
e) 102-JT Gland Condensor. - 1 no.
f) 103-JBT Gland Condensor. - 1 no.
g) 105-JT Gland Condensor. -1 no.
h) 800-J Surface Condensor. -1 no.
i) 800-JT Gland Condensor. - 1 no.
j) 851-C I / A Condenser. -1 no.

(VI) **Following seal coolers were opened, cleaned and boxed up:**

a) 104-J - Seal Cooler. -2 nos.
b) 104-JA - Seal Cooler. -2 nos.
c) 170-J /JA - Seal Cooler. -2 nos.

CODE NO	JOB DESCRIPTION

01 14 01 VALVE GLAND LEAK/FLANGE LEAK :

Following jobs were carried out during the shut down.

01) R-112 B/L valve d/s two drain valve gland repacked.
02) TRC-142 Steam control valve D/S line block valve gland repacked.
03) Exhaust valve D/S trap isolation valve gland repacked.
04) 101-F flow level switch drain valve gland repacked.
05) 800-JT Steam inlet F1 tapping isolation valve gland repacked.
06) HIC-800 HP tapping root valve gland repacked.
07) FRCV 1st D/S block valve gland repacked.
08) 3.5 Ata Steam to jacket for purge gas trap isolation valve gland repacked.
09) SP-4 bypass valve gland repacked.
10) 101-F Blow down sample line isolation valve gland repacked
11) HP , LP tapping isolation valve for FT-2 gland repacked.
12) 112-C outlet PIC-21 bypass valve D/S flange gasket replaced.- Size 4" x 150#
13) MS to HTS trap near LTS isolation valve gland repacked.
14) Sealing steam to TRC-10 first valve gland repacked.
15) Sealing steam to HCV-12 check valve top cover bonnet gasket replaced.
16) 2004-JT exhaust block valve gland repacked.
17) PIC-20 D/S flange gasket replaced.- Size 10" x 150#
18) FIC-1017 tapping root valve gland repacked.
19) 11 Ata steam to IITS block valve gland repacked.
20) MS to 11 Ata Desuper Heating valve gland repacked.
21) 101-J / 105-J main oil pump turbine steam inlet valve gland repacked.
22) 104-JT exhaust valve gland repacked.
23) 104-JAT ejector steam valve gland repacked.
24) V-5 block valve bypass valve gland repacked.
25) MS Header to R-112 Blow down valve gland repacked.
26) 38 Ata Header Ist ioslation valve gland repakced.
27) MS to Pre-reformer trap main isolation valve gland repacked.
28) 3.5 Ata steam to purge gas jacket isolation valve near 157-F gland repacked.
29) Auxiliary Boiler burner No.1 sealing team isolation gland repacked.
30) Sealing steam isolation valve of 103-JBT gland repacked.
31) SP-71 gland repacked.
32) 105-JT TTV D/S drain valve gland repacked.
33) 103-JAT steam isolation valve gland repacked.
34) 103-JAT exhaust valve D/S trap Ist & IInd isolation valve gland repacked.
35) 101-JT gland condenser ejector steam isolation valve gland repacked.
36) 102-JT steam inlet law pressure switch isolation valve bonnet gasket replaced - 1 ½ x 800#
37) 102-JT induction steam ESV drain flange gasket replaced.
38) LS to 800-J header isolation valve gland replaced.
39) 800-J gland condenser steam inlet PI tapping isolation valve gland repacked.
40) 107-JA suction line vent valve bonnet gasket replaced - Size 2" x 800 #.

CODE NO	JOB DESCRIPTION

41) FR-33 HP & LP tapping root valve gland repacked.
42) 101-F Eye hye isolation valve gland repacked.
43) Steam trap to isolation valve gland repacked near P-110.
44) 38 Ata steam to 11 Ata header Desuper heating station isolation gland replaced.
45) 38 Ata steam to ARU isolation valve near 103-J D/S vent valve bonnet gasket replaced. Size - 1 ½ x 800 #.
46) 38 Ata valve near cooling tower site main valve gland repacked.
47) E-2 Ammonia vapour outlet valve upstream flange gasket replaced - 1 ½ x 300#.
48) 38 Ata steam to 800-JT flow orifice flange valve gland repacked.
49) 38 Ata steam trap isolation valve gland condenser isolation valve of 107-JT repacked.
50) CEP turbine steam isolation valve gland repacked.
51) 38 Ata steam to 800-JT thermo couple flange gasket replaced.
52) PICV-5 snuffing steam 1st isolation valve gland repacked.
53) All Blow down valves gland repacked. - 11 Nos.
54) HCV-11 flange gasket replaced.
55) MIC-14 & MIC-15 flange gasket replaced.
56) 101-F LA-22 bottom valve D/S flange gasket replaced.
57) 101-CA Down comer Blow down valve gland repacked.
58) USV-1109 U/S drain line plug provided.
60) USV-1109 U/S & D/S flange gasket replaced - 1 ½ x 300#.
61) R-112 Pre-Reformer 2nd Bed sample valve gland repacked.
62) PIC-20 D/S flange gasket replaced.
63) E-110 LP steam flow transmitter HP tapping root valve gland repacked.
64) FRCV-1 D/S block valve gland repacked.
65) PI-100 root valve gland repacked.
66) FT-51 LP tapping root valve gland repacked.
67) FT-1017 root valve LP gland repacked.
68) FI-54 MS to HTS LP tapping root valve gland repacked.
69) IIICV-1004 D/S figure 8 flange gasket replaced.
70) 123-J common discharge valve gland repacked.
71) PRCV-25 transmitter root valve gland repacked.
72) Cold short U/S common isolation valve gland repacked.
73) 104-J Discharge isolation valve gland repacked.
74) BFW both 104-J pump discharge line common chain valve gland repacked.
75) 3.5 Ata steam trap isolation valve gland repacked.
76) 3.5 Ata steam to 171-C from Urea line trap isolation valve gland repacked.
77) SP-39 gland repacked.
78) LS from Urea to 104-E trap main isolation valve & bypass valve gland repacked.
79) 104-C tube site drain valve gland repacked.
80) 104-JA discharge line drain valve gland repacked.
81) 38 Ata steam header in drain 1st isolation valve gland repacked.
82) Naphtha filter D/S 1st isolation valve gland repacked.
83) PRC-142 steam control valve US/DS flange gasket replaced. 2" x 1500#.

CODE NO JOB DESCRIPTION

01 17 01 RV'S OVERHAULING AND TESTING :

Following Relief Valve were tested and their set pressures are as under.

SR. NO.	TAG NO.	SERVICES	SET PRESS. Kg /CM²	RESET PRESSURE KG/CM²	REMARKS
1	RV-LS-1	3.5 K STEAM HEADER	12.7		
2	RV-MS-9	38 K STEAM HEADER	42.2		
3	RV-102-D	102-D INLET	43.9		
4	RV-104-D-1	INLET LINE TO HTS	35.0		
5	RV-BFW-1	Offsite Coil RV	92		
6	RV-110-FA	110-F	7.0		
7	RV-110-F	110-F	7.0		
8	RV-111-F	111-F	6.3		
9	RV-112-F	112-F	6.3		
10	102-JLT-1	L.O.Turbine	4.0		
11	102 F	Raw gas separator	30.9		Setting increased by 2 kg/cm-2
12	RV S-7	11 ATA Steam	14.8		
13	123 C	BFW exchanger	122		
14	RV-101-F1 South Side	Steam	117.8	114	Seat lapped RV Floated
15	RV-101-F2 Middle	Steam	116.9	109	Seat lapped RV Floated
16	RV-101-F3 North Side	Steam	114.5	110.5	Seat lapped RV Floated
17	Super Heater Coil RV	Steam	111.5	108.5	
18	RV-106F (122- C)	Syn Gas	157.9		
19	104 E				
20	RV-112 C	Steam	10.8		

01 17 02 FURMENITE /FLANGE LEAK JOBS :

1) 102-C Top channel cover furmenited and same was opened and boxedup with new gasket.
2) 103 JAT Exchaust RV d/s flange clamp removed and boxed up with new gasket
3) 101 CB riser Flange clamp removed and boxed up with new gasket
4) 38 ata to HTS flow orifice flange furmanited and replaced by new flange.
5) PRC-25 flange clamp removed and boxed up with new gasket 4"x400#.
6) Atomizing steam to 101-B AG K.O.D.flange clamp removed and boxed up with new gasket 6"x400#.

CODE NO	JOB DESCRIPTION

01 19 01 **VESSEL INSPECTION**

Following vessels were opened for internal inspection are as follow.

1)102 F & 103-F opened for internal painting job
2)101-E CO2 Absorber & 102-EA/EB CO2 Stripper
3) Syn Gas Compressor Suction drum 104-F &105-F
4) Synthesis loop vessels 106-F,107-F,109-F
5) Flash Drum 110-F,111-F &112-F

(A) **CO_2 STRIPPER (102-EA/EB) :**

- After man way opening following observation were made
- I beam at both end got cracked to be replaced in next shutdown.
- U clamp broken at both end and same was welded.
- Side blind trays at top portion got cracked from many points
- All cracks repaired by rewelding.

(B) **102 F RAW GAS SEPARATOR :**

As per inspection report manhole nozzle weld got eroded and same was repaired by welding . 2" long stitch weld of baffle near gas inlet nozzle found cracked was repaired. Epoxy painting at inner surface was carried out after sand blasting the surfaces by M/S.Swati Corporation .

(C) **103 -F CO-2 STRIPPER REFLEX DRUM :**

As per inspection report manhole nozzle weld got eroded and same was repaired by welding . Epoxy painting at inner surface was carried out after sand blasting the surfaces by M/S.Swati Corporation .

60

CODE NO	JOB DESCRIPTION

01 20 01 **FABRICATION JOBS (IBR) :**

Job was awarded to M/S. Skywin Errector.

Sr. No.	Job Descriptions	Material used
1	Provision of common flange with Fig-8 in 105 ata steam line	Flanges Qty. 02 Nos. 12"x1500 # WNRTJ A-105
2	Provision of new tapping for level transmitter at steam drum (101 F)	Flanges Qty. 02 Nos. 1/2" NB pipe and 1/2" x 6000# Tee &
3	Provision of Orifice in 104 JAT steam inlet line	Flanges Qty. 02 Nos. 6" x 800# WNRF A-105

01 20 02 **FABRICATION JOBS (NON IBR) :**

(A) Following jobs were carried out M/S.Chaitnya Engineering Works.

Sr. No.	Job Descriptions	Material Descriptions
1	H-110(Naphtha Preheated) Coil elbow replacement	Elbow 90 BW 4" Sch80 A234 WP 11
2	101 B West wall top pannel near Br.no.114 replaced	CS Plate of 8 mm thk.
3	103 D jacket water shell box removed & plate welded	CS Plate
4	FI-54 MP steam to LTS Orifice flange replaced by new one	CS Companion Flange 4" x 600#
5	Atomising steam header above PO-4 dozing welded box removed	CS 90 Elbow 6" Sch.40
6	ID Fan C.W. Line re-routed to avoid fouling platform	CS Pipe 1"
7	107 JT C.W. Line fabrication	CS Pipe 3/4"
08	Platform fabrication for superheated RV	Checker Plate of 6 mm thk.

CODE NO JOB DESCRIPTION

(B) Fabrication job departmentally

Sr. No.	Job Description	Material Description
01	38 ata steam to NGBC(HIC-800) bypass valve d/s pin hole leak attended	
2	101 J Gear box breather pipe line extended	
03	LC 3A d/s block valve replaced	CS Gate valve 2" x 800#
04	101 E Absorber 101 E outlet sample line valve replaced	CS Gate valve 1/2" x 800#
05	PIC 20 d/s drain line extended	CS Pipe 3/4"
06	NH-3 drain line connected with drain header	CS Pipe 3/4"
07	129- JC,130-JC,131-JC CW outlet valve replaced with Glove valve	
08	170-CA north side channel cover repaired by welding	
09	fabricated box of Thermowell 101-JT Steam inlet line and TRC-142 removed and repaired	
10	103 JAT to JLP Coupling gaurd modificd into bellow type	
11	129 JC level troll line pin hole attended	
12	129 JC tube bundle covering sheet replaced by SS	SS 304 ,2mm thk.
13	38 ata steam vent valve at C.W. Jump over line replaced	C.S.Gate Valve 3/4"
14	102 JT steam inlet block valve bypass valve replaced	C.S.Gate Valve 1/2"x1500#
15	V-1 U/S Trap first I/V replaced	C.S.Gate Valve 1/2"x800#
16	105 ata steam sample furmanited valve replaced	C.S.Gate Valve 3/4"x1500#
17	MS Header drain valve near 113-J pillar replaced	C.S.Gate Valve 1"x1500#
18	102 JT LS induction steam block valve u/s drain valve replaced	C.S.Gate Valve 1"x800#
19	102 J Discharge separator oil drain line fabricated	CS Pipe line 3/4"
20	121 J/JA drain valve provided in main suction valve u/s	C.S.Gate Valve 3/4"x800#
21	BFW line from LT coil weldolet pin hole leak attended by cut re-welded radiography joint	
22	800 J for purging permanent line provided	CS Pipe line 3/4"

62

PLANT TURNAROUND - MARCH - APRIL - 2002

AMMONIA PLANT

INSPECTION JOBS

CODE NO	JOB DESCRIPTION

01 41 01 INSPECTION JOBS :

During March-April,2002 Shutdown from 20.3.2002 to 22.4.2002, the following major inspection activities were performed in Ammonia Plant.

1. Automatic ultrasonic scanning of all the Catalyst and Riser tubes in Reformer Furnace.
2. Insitu metallography of selected equipment and pipelines.
3. Thickness measurement and visual inspection of equipment and pipelines.
4. Ultrasonic flaw detection on selected weld joints of critical pipelines and equipment's.
5. Inspection of newly fabricated pipelines for replacement which mainly include, Process gas line (PG-7-12"), small segments of line including LCV-13 replacement and its loop modification, hot and cold ammonia mixing line to NH-14-150 and other miscellaneous pipe lines.
6. Qualification tests of welders employed by contractors.
7. Visual inspection of equipment's.

The detailed observations and recommendations for corrective actions required on individual equipment 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, HT-LT convection zones and Hot well of Auxiliary boiler etc. was carried out. The detailed report on observations made was enclosed herewith at Annexure-1.

The following important observations were made during this shutdown.

a) The brick lining on East wall at the tunnel slab level of the Primary Reformer radiant zone found to have got bulged-inward causing gap between lining and metallic wall was replaced partly in the affected area during this shutdown. Selected brick panels were also replaced on North wall and West wall by Civil Section as per the observations made.

CODE NO JOB DESCRIPTION

b) The Reformer outlet Collector header insulation was found damaged at different locations indicated at Annexure-1. The insulation was repaired at these locations after completion of header clearance and creep measurement job.

c) The fiber blankets in the HT convection zone are covered by SS-310 sheets. This sheet had got badly buckled and burnt off loosing its strength. The exposed fiber blankets have got the erosion effect due to high velocity of flue gases and therefore it was recommended to replace the protective sheet with incolloy sheet. The same was replaced by new incolloy sheet particularly in the wall area below Mixed Feed Coil.

d) The LT steam super heater coil had got sagged as had 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. Insitu metallography of the selected tubes revealed micro cracks.

e) On Aux. boiler furnace refractory lining was peeled off at few locations particularly behind the east side coils, top and bottom headers on North wall.

f) The Arch burner blocks which were found damaged in visual inspection of the furnace were replaced by Maintenance group.

2. OTHER NDT ACTIVITIES:

a) Automatic ultrasonic scanning of all the 336 Catalyst tubes and 8 Risers tubes was carried out during Shutdown by PDIL. In all, 13 tubes were detected in 'D'grade category, i.e. more deteriorated tube condition indicating voids, micro and macro fissures in the tube wall Same 13 nos. Of tubes were found in D grade during last turnaround inspection. 323 tubes were observed to be in `C' grade category [C1-03 nos, C2- 45 nos, C3- 275 nos] All riser tubes are in `C' grade category. [C1-01 no.,C2-06 nos.,C3-01 no.] There was no appreciable deterioration in condition of the tubes though some tubes operated with hot bands for long time. The summary of tube conditions is enclosed herewith at Annexure-2.

b) Insitu metallography of H.T. And L.T. Steam super heater coil was carried out at two nos. of bends on each coil. The report on findings is separately enclosed.

c) Outlet manifold field weld joints (16 nos.) were radiographed for all the eight rows. No service defects were observed in any joint.

d) DP test of all the 16 Nos. header field weld joints was carried out. DP test of riser tube to weldolet and weldolet to header weld-joints was carried out for all the risers. Also DP test of weld joints of catalyst tube to weldolet and weldolet to outlet header joints in each row was carried out at the locations where insulation was found in damaged condition. No defects were revealed.

CODE NO JOB DESCRIPTION

e) Creep measurement of all the catalyst tubes was carried out using GO-NOGO Gauge. No recordable Creep was found in 150 nos. of tubes and creep was upto 0.73 % in 185 nos of tube. Only one tube no. 731 was in the creep range of 1.3 to 2.5 % which was also observed in the past.The details showing the creep of individual tubes is attached at Annexure-3.

f) Creep measurement of Riser Tubes was also carried out. The report is attached herewith at Annexure-4. Max. Riser O.D. was measured to be 4.9623" which corresponds to 0.52 percent creep.

g) Creep measurement of outlet headers was carried out. The report is attached herewith at Annexure-5. Max. header O.D. was measured to be 5.6244" which corresponds to 0.5 percent creep.

h) Bottom header clearance was taken (without insulation). The report is attached at Annexure-6. The clearance was found to be adequate.

i) Spring hanger readings of catalyst tubes, transfer line and collector header drain readings in cold condition were taken. The report is attached herewith at Annexure-7.

j) East wall panels of HT and LT Zone were opened during this shutdown. Thickness measurement of coils was performed. The detailed thickness data is available at Annexure-8 .

k) West wall header box panel segment of L.T. Convection Zone was opened for thickness measurement on Ammonia BFW Coil tubes.No considerable reduction in thickness was observed.Minimum thickness of 4.7 mm was observed against design thickness of 5.54 mm which was within safe limit.

(B) AUXILIARY BOILER :

(1) HOT WELL AREA:

VISUAL INSPECTION: Visual inspection of hot well area of auxiliary burner was carried out. The observations were as under.

a) Castable refractory on the east wall was found fallen down/detached from few location and also from west side top most panel, the same was found fallen down in approx. 50% area.

b) Flue gas distributor holding bolts were found loose/missing and the stiffeners of the same had got burnt/detached at few locations which had resulted in distortion of the distributor plates.

c) Loose refractory castable/bricks were lying on the floor, particularly on the north side.

CODE NO JOB DESCRIPTION

(2) FURNACE AREA :

a) Insitu metallography was carried out on tube of coil-A ,B and C which had got deformed. The detailed report is available at Point no.5 Insitu metallography examination report.

b) The bowing/bending of the tubes was also measured. The bowing of 18 mm to 133 mm was observed on tube nos. 44 to 60 on East wall, 12 to 125 mm on tube nos. 45 to 60 on West wall, 30 to 110 mm on tube nos. 1 to 24 of North wall.

c) Refractory was found fallen at few location from the inlet and outlet header of the coil located at north side wall.

d) Hard deposits/scales/refractory debris were found adhered to the surface of all the tubes.

e) Erosion of refractory lining was observed on east and west wall. Refractory was found detached at few location on East wall.

f) Three nos of castable refractory blocks at the cone of burner no.1 were found damaged and scattered cracks were observed on the cone of other burners.

g) A vertical crack was observed on brick wall above 5th burner.

h) Thickness measurement of tubes were carried out. Minimum thickness of 6.2 mm was observed against design thickness of 7.01 mm.

CODE NO	JOB DESCRIPTION

01 41 02 **VESSELS AND OTHER EQUIPMENT:**

1) **Inspection Report of 101-CA and CB before removal of distributors:**

101 CA:

1 .First and Second (Small) shell course counting from bottom and the bottom liner were badly buckle and needed replacement. The amount of inward distortion of shell liner was about 6 to 8 inches.

2. The bottom liner had got damaged and distorted by about 4 to 6 inches.

3. Thc distributor was in fairly good condition with littlc distortion.

4. The shell liner at North end of the distributor at appx. 10 O'clock position had got torned out by about 8 inch length.

5. No other major abnormality was observed except minor deformation in the shell liner at scattered locations.

6. All the other liner segments were intact in position above the distributor and nowhere the refractory had got exposed.

7. Liner and distributor was replaced as per requirement and DP test of all new weld joints was carried out.

101-CB:

1. The gas distributor had got badly damaged and opened up from 9 o'clock and 3 o'clock positions.

2. Between 4th and 5th course (Counting from top), the shell refractory had got exposed in appx. 5 in length on the complete circumference due to the downward shift of the 5th liner course.

3. The refractory at the above location had got cracked into pieces in almost 75 to 80 percent circumfere The refractory was found wet during inspection.

4. Pitting marks of 1 to 3 mm diameter and appx. 0.5 to 0.7 mm depth due to metal dusting were obser on the shell course no. 2 and 3 which were predominant in the South and West side..

5. 3rd liner course had also got bulging of appx. 1 inch height and in 2 feet circumference on South We side The liner at the distributor elevation and below, had got badly damaged and needed replacemen

6. Appx. 1 inch to 1.5 inch gap was seen behind the bottom end of the 4-th course shell liner. The refractory of 1 to 1.5'' thickness was missing behind the liner.

7. Liner and distributor was replaced/repaired as per site requirement and DP test of all new weld joint was carried out.

CODE NO JOB DESCRIPTION

2) 103-D, SECONDARY REFORMER:

SECONDARY REFORMER BOTTOM:

Jacket was cut in appx. 1 metre x 1 metre area for inspection of the cone welds. Visual inspection of Secondary Reformer Bottom dome was carried out after removal of plug of bottom manhole. The following observations were made.

(A) BOTTOM DOME AREA :

a) The condition of the shroud liner was found satisfactory.

b) Top dome refractory brick lining had got slightly damaged at three locations just near center portion.

c) Dome bricks were found intact except their slotted holes were found choked at some places.

(B) 101-CA GAS INLET NOZZLE :

a) The transfer line liner had got deformed by about 2 to 3" from 11 O'clock to 3 O'clock position.

b) Refractory had got exposed in about 6 to 8" length on complete circumference at about 2 mtrs. Distance from 103-D end.

(C) 101-CB GAS INLET NOZZLE:

a) The transfer line liner had got deformed by about 2 to 4" inward and fracture in almost 80 % circumference particularly more on 9 to 12 O'clock position. Two segment of liner are touching each other obstructing free expansion at 1.5 mtr. Distance from 103-D end. The same was attends and got repaired by mech. Maint. Section.

(D) TOP CONICAL SECTION :

The jacket was cut in approx. 1 meter x 1 metre area at the top dome elevation. The following inspection activities were performed, results of which are shown against each activity.

A. Ultrasonic Flaw detection of the cone longitudinal seam was carried out in 1160 mm length. No service defects could be detected. Scattered lamination spots were observed on the parent plate of the cone (towards south side of the window) in appx. 605 mm width which have been marked for reference. This area will be again inspected during next shutdown to monitor the same.

CODE NO JOB DESCRIPTION

B. The joint was examined by dye penetrate examination and no defects were detected.

C. Hardness was measured on the weld, HAZ and the parent plate of the cone. The following observations were made.

On Weld- 177 BHN
On parent plate of cone- 170 BHN
On Heat Affected Zone- 173 BHN

D. Insitu metallography was carried out to detect any deterioration in metal microstructure. No major abnormality was detected in three locations (parent plate on either side of the weld as well as on the weld joint itself) whereas at one location i.e. On the HAZ, spherodization of the pearlite was revealed leading to second stage creep. This location will be inspected next year for monitoring the trend.

E. Thickness measurement of the cone plate was carried out during ultrasonic flaw detection. No reduction was detected in thickness. Minimum thickness was found to be 75 mm against design thickness of 71.44 mm.

(3) 101-E CO2 ABSORBER:

Visual inspection of the top and bottom compartment was carried out. In general,it had been observed that there was no further corrosion attack on shell and dished end after switching over to mDEA solution. The following observations were made.

TOP COMPARTMENT :

a) The demister pads were found intact in position.

b) External surface of all the three L shaped distributor pipes was found to be corroded / eroded on approx. 40 % of its area by a depth of about 1 to 1.5 mm. Scattered pitting observed along the surface of distributor pipe.

c) Shell surface surrounding the mDEA inlet header was found to have corrosion / erosion attack in triangular shape also extending circumferentially in either direction with maximum depth of about 1 mm.

d) Minor corrosion attack was observed on inlet header external surface and also on welding joints of header to distributor pipes, flanges, particularly more on the weld of flanges of inlet header portion at center. At few locations, corrosion attack had been seen between fasteners and flange face.

CODE NO JOB DESCRIPTION

e) M-seal which was provided during previous shutdown to cover corrosion cavities were found peeled off at few locations and also scattered cavities/pits of approx. 2 to 3 mm depth were observed surrounding these areas.

f) Some of the fasteners of sieve trays found loose and at seven locations were found missing.

g) Corrosion attack observed on fillet welding of shell to tray support plate on east side resulting in pitting and at one spot pinhole of depth of approx. 4 mm was observed.

h) Ultrasonic thickness measurement was carried out on corrosion affected area surrounding mDEA inlet header . Mini. thickness on shell was found to be 48.5 mm against design thickness of 47.6 mm.

BOTTOM COMPARTMENT :

a) The liquid outlet nozzle was observed to have annular gap between nozzle inside diameter and SS sleeve outside dia. Only stitch welding had been provided to hold the sleeve. Same was repaired by grinding and welding.

b) The condition of gas distributor header found intact except one no .clamping bolt on north side was found loose.

c) Ceramic coating provided in the past to cover corrosion cavities on shell was found intact in position.

4) 102-EA, CO2 STRIPPER:

Visual inspection of vessel top and bottom from inside was carried out . The detailed observations are given below.

a) Welding of the perforated plate provided on west side of distributor pipe was not complete at its north end and welding was carried out from out side only.

b) Thc portion of distributor hcadcr on cast sidc was obscrvcd to bc supportcd with support plate on length of 2" on north side and 4" on south side. Similarly ,portion of header on west side was supported on 1/2" length on north side and 4" on south side. Extra wedge type SS plate provided below header end cap i.e. Between

CODE NO JOB DESCRIPTION

header ends and saddle support was found loose on east side at north end. Shiny surface was seen on these saddle/angle support. Anchor support plate found missing on both the ends of both side of header.

c) 1" NB pipe support provided at S-N direction for reinforcement between support plates was found damaged and lying down on sieve tray on west side and pipe on east side was also found damaged from welding on south end.

d) Support plate of header welded with shell was found cracked in north-west, north-east direction and also at one location 3"x2" plate area found sheared off resulting in opening.

e) Bolts of diagonal I beam support were found loose and its welding with shell support on south-west end found cracked.

f) Sieve trays fasteners were found loose and missing at many places.

g) Seal trays provided on extreme east and west direction just below the portion of header found cracked at many places just behind/near the vertical partition plate located in north-south direction.

h) Bolts of weir plate provided on east side found loose/missing at many places. West side weir plate found intact in position.

i) A gap of approx. 2-3 mm was observed between C clamp and Central portion of distribution header.

j) Demister pad on top found intact in position.

k) Bolts of liquid inlet nozzle flanges were found loose which resulted in gap between the flange faces and tearing of gasket also.

Repairs/replacement action was taken by mech. Maintenance group and subsequently the vessel was reexamined.

5) <u>102-EB, CO2 STRIPPER:</u>

Visual inspection of vessel top and bottom from inside was carried out . The detailed observations are given below.

a) Welding of the perforated plate provided on west side of distributor pipe was not complete at its north end and welding was carried out from out side only.

b) The portion of distribution header was supported on support plate in a length of 3" on its both ends for east and west side distributor pipe.

CODE NO JOB DESCRIPTION

c) C -clamp of header portion on north-east side found damaged from the bolt portion on both sides and found displaced completely.

d) Demister pads were found intact in position

e) Extra wedge support plate provided on bottom of header ends was found loose on west side header on its north end.

f) Bolts of I-beam support found loose and its welding at north-west end found cracked.

g) Support plate of header with shell found cracked in north-west and north-east and south-east directions.

h) Tray holding bolts were found loose / missing at few locations which were marked for proper fastening.

i) Weir plates found intact in position.

j) A gap of approx. 2-3 mm was observed between C clamp and Central portion of distribution header.

k) Bolts of liquid inlet nozzle found loose which resulted in gap between the flange faces and tearing of gasket also.

Repair / replacement action was taken by mech. maintenance group and inspection was performed subsequently.

BOTTOM COMPARTMENT : 102-EA/EB, CO2 STRIPPER:

a) Coloration of shell and dished end was grayish black.

b) Wear plate and its fasteners were found intact.

c) Scattered minor black scaling observed on inside surface of shell and dished end.

d) Center nozzle on bottom dished end and its anti swirl plate was found satisfactory.

CODE NO JOB DESCRIPTION

6) **101-F, STEAM DRUM:**

Visual inspection of Steam Drum was carried out from inside. The following observations were made.

1. Thc Drum had grcyish black colouration from insidc.
2. 6 Nos. of fastening bolts of West side separator plates were missing/broken..
3. 9 nos. of fastening bolts of East side separator plates were found to be sheared off/missing.
4. Between 4th and 5th downcomer (counting from South to North) there was a nozzle of 1" NB size at bottom portion of the shell (Intermittent blow down line) which was found choked.
5. Pinhole of appx. 3-4 mm dia was observed on the welding of 6" BFW distributor pipe near flange joint.(East side of shell)
6. All the cyclone separator were found intact in position.
7. Demister pads located at top were found intact in position.
8. Pitting of approx. 0.5 to 0.75 mm depth were observed on south dished end on its west side on a circular area of approx. 15mm.
9. A circular cavity of approx. 3mm dia x 1 mm depth was observed at top. Pitting of approx. 0.5 mm depth were observed in a circular path of approx. 1 " dia on west side at the top and bottom of south dished end.
10. 2 nos. Of circular cavity of approx. 3 mm dia. x1mm depth were observed on east side of shell at south end of vessel.
11. Clamping bolt of boiler feed water line south end of 6" NB distribution header was found corroded. Holes of the same were found enlarged to 25-30 mm as compared to holes of other pipe segment having holes of approx. 1/2". Thickness measurement of this pipe was carried out and min. thickness of 2.1 mm was observed on one bend which was replaced.
12. Ultrasonic thickness measurement was carried out.Mini.thickness on shell was found to be 109.1 mm and 103.7 mm on dished end against design thickness 106.4 mm for both shell and dished end.

CODE NO JOB DESCRIPTION

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 which was repaired by putting stainless steel sleeve during April - 2000 shutdown was found satisfactory from inside. IIowever, antiswirl baffle plate was found missing over this nozzle face.

2. Epoxy paint had got peeled off at scattered locations and metal surface got exposed and lots of pitting up to a depth of approx. 4 mm were observed on this surface particularly on south-west and north-west direction at elevation of 6" from circumferential weld of bottom . Repainting was performed during this shutdown.

3. Manhole nozzle weld had got erosion/corrosion in approx. 3 mm depth on 75 % of its circumference and weld appears porous. Shell surface just above manhole also had few pitting corrosion cavities.

4. Demister pad at top was found intact in position ,one no. of nut of its holding plate fastener was found missing.

5. Inside surface of gas inlet nozzle located on east side found to have minor pitting and its baffle plate stitch welding at places found cracked.

8) 103-F REFLEX DRUM :

Visual inspection of the drum was carried out before and after application of epoxy paint on the internal surface . The following observations were made.

1. On North side, one no. demister pad segment was found opened by about 6" width.

2. On North-West side at a height of about 1.5 mtrs. from bottom paint was found peeled off in approx. 600 mm x 600 mm area. It was also observed on few scattered locations.

3. Bottom dished end painting had got swollen at various places. Blackish material deposition was found at the places from where paint was swollen and broken.

4. CO2 inlet nozzle had got signs of erosion in approx. 40 % circumference on west side including nozzle face of CS material, width of the same was ranging from 40 mm from one end to 10 mm from other end of eroded portion. This was repaired followed by DP testing.

CODE NO JOB DESCRIPTION

5. Epoxy paint was applied on complete internal surface of the vessel and the thickness of the same was measured and found satisfactory as below.

On shell surface.:

East side : 62 - 89 microns
West side : 75 - 96 microns
North side : 84 - 94 microns
South side : 72 - 102 microns

On Dished end : 212 - 250 microns.

9) 104-F SYN. GAS COMPRESSOR SUCTION SEPARATOR :

Visual inspection of the separator was carried out. The following observations were made

1. Coloration of the vessel bottom was observed to be grayish black where as brownish coloration was observed on remaining surface.

2. Demister pad was found intact in position.

3. All the weld joints as seen visually from inside were found free from any sign of corrosion/erosion.

4. Overall condition of the vessel was found satisfactory.

10) 105-F SYN. GAS COMPRESSOR Ist STAGE SEPARATOR :

1. The coloration of vessel was brownish black from inside.

2. Condition of demister pad found satisfactory, however, one no. of fastener of demister pad holding ring was found missing.

3. Scattered minor pitting were observed throughout the shell surface, the same was observed in past also.

4. The overall condition of the vessel was found satisfactory.

11) 107-F PRIMARY AMMONIA SEPARATOR:

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

1. Colouration of vessel internals was found blackish brown
2. Scattered thin scales were observed on the shell and dished end.
3. The overall condition of the vessel was found to be satisfactory.

CODE NO JOB DESCRIPTION

12) 109-F REFRIGERANT RECEIVER :

1. The shell had assumed grayish black coloration.
2. The condition of all the weld joints of the shell, dished ends and nozzles was found to be satisfactory.
3. Thin scales were observed on both the dished ends.
4. Minor scattered pitting /scales were observed in a width of approx. 250 mm throughout the length of the vessel at its bottom most portion.
5. Overall condition of the vessel was found to be satisfactory.

13) 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 weld joints were found free from any sign of corrosion.
5. Scattered mill scales were observed on dish ends and shell.
6. Overall condition of the vessel was found to be satisfactory.

14) 111-F, SECOND STAGE REFRIGERANT FLASH DRUM:

The following observations were made during visual examination.

1. The shell inside surface had assumed blackish gray coloration.
2. All the weld joints as seen from inside were found to be free from any corrosion.
3. Thin layer of oil was observed on the complete inside surface.
4. The demister pads were found intact in position and in good condition.
5. Scattered scales were observed on both the dished ends.

15) 112-F, THIRD STAGE REFRIGERANT FLASH DRUM:

The following observations were made during visual examination.

1. The demister pads were found intact in position.
2. The coloration of the inside surface of shell was dark blackish.
3. Oil was found sticking to the vessel shell.
4. Hard scales were observed in the shell which were more prominent on the dished ends.
5. Overall condition of the vessel was satisfactory.

CODE NO	JOB DESCRIPTION

16) 101-U, DEARATOR :

1. Shell surface was found brownish in colour.
2. Six nos of tray elements pieces were found fallen at the bottom of stripper portion.
3. Water level was found at the bottom of the stripper, drain was asked to be checked for choking.
4. On the west side of stripper, strips packing cover were found hanging.

17) B-201 , FLARE STACK :

Bottom Compartment. (Knock Out Drum):

1. Shell had assumed blackish Coloration on top half portion and brownish black on bottom half portion.
2. The welding joints of the shell was found in satisfactory condition.
3. Corrosion attack had been observed on an area of approx. 2' x 1' x 2.5 mm depth at north-east side just below the gas inlet nozzle on shell surface. Thickness at the corroded portion was observed to be 8.1 mm. In general minor roughening of shell surface had also been observed below gas inlet nozzle elevation.
4. Gas inlet pipe at the centre of top head found to have corrosion attack at its ID and face.
5. The inside welding of 3"NB centre nozzle to elbow was observed to have severe defects.
6. Pinhole/cavity was observed just near 11/2" bottom nozzle at south-east side and also near 1 1/2" nozzle at south-west side.
7. There was an indication of leakage from telltale hole of RF pad of manhole cover. Pinhole observed on east side of manway. These leakage should be detected by pressurising at 0.5 Kg/cm2 air from telltales hole and apply soap solution on the weld. Repairing of the same was recommended.

TOP COMPARTMENT :(WATER SEAL DRUM)

1. Coloration of shell top half and top cone was grayish black whereas brownish for the bottom half.
2. Several scattered wide spread spots of brownish colour were observed on top half of shell and top cone.

CODE NO	JOB DESCRIPTION

3. The perforated conical round plate of seal pot found to have buckled/distorted throughout the circumference and seal pot duct pipe had minor corrosion attack on its OD.

4. Pits/cavities of approx. 2.5-3 mm depth observed on shell surface at five locations just near circumferential weld seam above manhole elevation. Repairing was recommended.

5. Welding had not been provided below RF pad on north side channel for holding seal pot duct. Repairing was recommended.

6. 3" skimmer (funnel) pipe and 11/2" NB seal waster make up pipe surface found to have lots of scaling/rusting.

7. Lots of rusting/sludge observed on internal surface of bottom half portion of shell and also bottom dished end. Proper cleaning was recommended.

8. Severe corrosion attack observed on complete bottom dished end surface and was observed predominant at four locations. Thickness measurement on these locations was carried out . Min. thickness observed to be 7.3 mm and Max. thickness observed to be 12 mm. (i.e. 39 % reduction was observed.)

9. Suitable protective coating was recommended on internal surface of shell and dished end to avoid further corrosion.

CODE NO	JOB DESCRIPTION

01 41 04 **MISCELLANEOUS JOBS:**

1. **WELDER QUALIFICATION TESTS:**

a) Performance qualification test of 30 Nos. welders offered by M/s Mahavir Engrs., and Ram bahadur & Co. was carried out. 10 Non-IBR Welders were qualified during the test. These welders were allowed to perform various miscellaneous non-critical departmental welding jobs in the plant. One welder was qualified for IBR weld joints.

b) Performance qualification test for 10 Nos. welders was carried out for M/s Petron Engg., out of which 8 welders were qualified. The fabrication of new H. P. Stripper pipings was carried out by this agency.

c) Welder qualification test of 4 Nos. welders of M/S. Skywin Engrs.,was carried out. All welders were qualified for performing welding jobs of liner replacement of 101-CA/CB .

d) Welder performance qualification test for 02 Nos. welders of M/S Chaitanya Engrs.,was carried out. 01 no of welder was qualified . The fabrication of process gas line PG-7-12" was carried out by this agency.

2. **D.P. TEST:**

Dye penetrant examination of weld joints of all the pipelines fabricated by M/s Chaitanya Engg, for PG lines, Boiler feed water lines, Cold-hot ammonia lines, LCV-13 connected lines, NG lines, 101 CA/CB liner replacement etc. 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.

3. **RADIOGRAPHY:**

In order to ensure immediate radiography work and urgent processing of films, teams were hired on round the clock basis during entire shutdown period. Radiography was performed on the weld joints of the pipe lines fabricated by all contractors as well as departmentally . Also radiography was carried out on field weld joints of outlet manifold of primary reformer .

4. **INSITU METALLOGRAPHY EXAMINATION:**

In order to evaluate the condition of certain critical plant equipment and pipelines operating at high temperatures, Insitu metallographic examination was carried out. The details of spots examined on individual equipment are given below. Considerable degradation of the microstructure was observed on the following equipments:

CODE NO JOB DESCRIPTION

1. LT Steam Superheater coil 2. Mixing Tee (102-C Outlet to HTS) 3. Methanator 4. Auxiliary boiler tubes 5. HTS to 103-C pipe line

It is proposed to replace LT Steam Superheater coil, Mixing Tee and selected auxiliary boiler tubes based on these findings. Rest of the items will be monitored during next shutdown to observe the trend of deterioration.

SR. NO.	EQUIPMENT	MATERIAL	OBSERVATIONS	COMMENTS
1	104-JAT Turbine casing Top on steam inlet side	Cast Iron	Microstructure shows ferrit-pearlite and flakes of graphite	Does not show indication of any damage . Monitor after five years.
2	104-JAT Turbine rotor 1st stage disc on H.P. region	Cr-Mo Steel	Microstructure show ferrito-bainitic structure. Degradation of basinite was initiated.	2nd stage of creep damage. Monitor after five years.
3	101-JT Turbine casing top,Groove for 1St stage		Microstructure show ferrite-pearlite structure with isolated creep cavities	2nd stage of creep damage. Monitor after five years.
4	101-JT Turbine casing top,Groove for 8Th stage		Microstructure show ferrite-pearlite structure. Insitu degradation of pearlite was initiated with isolated creep cavities	Level I degradation. Monitor after five years.
5	106-D Mcthanator shell (East side)	SA 204 GR.B C-1/2Mo	Microstructure show ferrite-pearlite structure. Insitu sphcrodization of pcarlitc was obscrvcd.	Level I dcgradation. Monitor after five years.
6	106-D Methanator On Weld between shell and bottom dished end. (East side.)	SA 204 GR.B C-1/2Mo	Microstructure show ferrite-pearlite structure. Disintegration of bainite was observed.	Level I degradation. Monitor after three to five years.
7	106-D Methanator on HAZ of weld between shell and bottom dished end. (East side.)	SA 204 GR.B C-1/2Mo	Microstructure show ferrite and fine pearlite structure. Initiation of micro-cracks are observed	2nd stage of creep damage. Monitor after one year.

CODE NO JOB DESCRIPTION

SR. NO.	EQUIPMENT	MATERIAL	OBSERVATIONS	COMMENTS
8	106-D Methanator Bottom dished end(East side)	SA 204 Gr.B C-1/2 Mo.	Microstructure show ferrite-pearlite structure.	No significant defect observed. Monitor after five years.
9	106-D Methanator Bottom dished end, Opposite to PICV-5	SA 204 Gr.B C-1/2 Mo	Microstructure show ferrite-pearlite structure. In-situ spherodization of pearlite was observed.	Level I degradation. Monitor after five years.
10	103-D Secondary Reformer On parent metal(north) at top cone after jacket cutting.	Carbon steel	Microstructure show ferrite-pearlite structure.	No significant defect observed. Monitor after three to five years.
11	103-D Secondary Reformer, On Weld metal (East side) at top cone after jacket cutting.	Carbon steel	Microstructure show ferrite,carbides and bainite. Degradation of bainite was initiated.	Level I degradation. Monitor after three years.
12	103-D Secondary Reformer, On parent metal(north) at top cone after jacket cutting.	Carbon steel	Microstructure show ferrite-pearlite structure with initiation of In-situ spherodization of pearlite was observed.	Level I degradation. Monitor after three years.
13	103-D Secondary Reformer On Weld HAZ (East side) at top cone after jacket cutting.	Carbon steel	Microstructure show ferrite-pearlite structure at HAZ(Heat affected zone). Spherodization of pearlite was observed. Initiation of micro-cracks are observed.	2nd stage of creep damage. Monitor after one year.

CODE NO JOB DESCRIPTION

SR. NO.	EQUIPMENT	MATERIAL	OBSERVATIONS	COMMENTS
14	Auxiliary Boiler Tubes. East wall tube no. 60(S to N) at 3.5 mtr. Height from floor level.	Carbon Steel	Microstructure show ferrite-pearlite structure with widmanstatten ferrite.	Tube seems to have heat affected. Recommended to replace tube no.44 to 60 at next opportunity.
15	Auxiliary Boiler Tubes. West wall tube no. 55(S to N) at 3.5 mtr. Height from floor level.	Carbon Steel	Microstructure show ferrite-pearlite structure. Pearlite was observed at the grain boundaries.	Tube seems to have heat affected. Recommended to replace tube no. 45 to 60 at next opportunity.
16	Auxiliary Boiler Tubes. North wall tube no.12 (E toW) at 3.5 mtr. Height from floor level.	Carbon Steel	Microstructure show ferrite-pearlite structure with widmanstatten ferrite.	Tube seems to have heat affected. Recommended to replace all 24 tubes at next opportunity.
17	101-F Downcomer going to Auxiliary boiler Coil-C	C.S.	Microstructure show ferrite-pearlite structure	No significant defect observed. Monitor after three to five years.

CODE NO JOB DESCRIPTION

SR. NO.	EQUIPMENT	MATERIAL	OBSERVATIONS	COMMENTS
18	H.T. Steam Super heater coil, On weld at bend on 9th coil(S to N) of lower row.	A234WP 22 21/4Cr-1Mo	Microstructure show ferrite and bainite structure. Disintegration of bainite was observed.	Level II degradation. Monitor after two years.
19	H.T. Steam Super heater coil, at bend on 10th coil (S to N) of upper row.	A234WP 22 21/4Cr-1Mo	Microstructure show ferrite and pearlite structure with carbides. Initiations of creep cavities are observed.	Level I degradation. 2nd stage of creep damage. Monitor after three years.
20	L.T. Steam Super heater coil, at bend on 15th coil (S to N)	CS	Microstructure show ferrite-pear lite structure. In-situ spherodization of pearlite was observed. Longitudinal micro cracks are observed.	Approaching 3rd stage of creep damage. Replacement recommended.
21	L.T. Steam Super heater coil, at bend on 15th coil (S to N) after approx. 0.5mm grinding	CS	Microstructure show ferrite-pearlite structure. In-situ spherodization of pearlite was observed. Longitudinal micro cracks are observed.	Approaching 3rd stage of creep damage. Replacement recommended
22	L.T. Steam Super heater coil, at bend on 15th coil (S to N) after approx. 0.5mm grinding	CS	Microstructure show ferrite-pearlite structure. In-situ spherodization of pearlite was observed. Longitudinal micro cracks are observed.	Approaching 3rd stage of creep damage. Replacement recommended

CODE NO JOB DESCRIPTION

SR. NO.	EQUIPMENT	MATERIAL	OBSERVATIONS	COMMENTS
23	103-C, West heat exchanger At channel cover.	SA387 Gr.11 CL 2 11/4 Cr 1/2 Mo	Microstructure show ferrite, pearlite and bainite. Degradation of bainite and pearlite was observed. Isolated creep cavities are observed.	Level I degradation. 2nd stage creep damage. Monitor after three years.
24	Pipe line PG-6-18" (HTS to103C) On bend at East side.	11/4 Cr 1/2 Mo	Microstructure show essentially ferritic structure with few carbides. Oriented creep cavities are observed.	Approaching 3rd stage of creep damage. Monitor after one year.
25	Pipe line PG-6-18" (HTS to103C) On bend at East side after 0.5 mm grinding.	11/4 Cr 1/2 Mo	Microstructure show essentially ferritic structure with few carbides. Oriented creep cavities are observed.	Approaching 3rd stage of creep damage. Monitor after one year.
26	Pipe line PG-6-18" (HTS to103C) On weld/HAZ before bend going to 103-C	11/4 Cr 1/2Mo	Microstructure at heat affected zone show very coarse ferrite grains. At HAZ accumulation of creep damage was observed in form of cavities and micro cracks.	Approaching 3rd stage of creep damage. Monitor after six months.
27	Pipe line PG-6-18" (HTS to103C) On vertical pipe before bend going to 103-C	11/4 Cr 1/2Mo	Microstructure show essentially ferritic structure with few carbides. Oriented creep cavities are observed with initiation of micro cracks.	Approaching 3rd stage of creep damage. Monitor after six months.
28	Pipe line PG-7-12" (New line) at upstream of IICV-12	11/4 Cr 1/2Mo	Microstructure show ferrite-pearlite structure. In-situ spherodization of pearlite was observed	Useful as a baseline data for future degradation.

CODE NO JOB DESCRIPTION

SR. NO.	EQUIPMENT	MATERIAL	OBSERVATIONS	COMMENTS
29	157-F Process Knock Out Drum	SA387 Gr.D, C.S.	Microstructure show ferrite- pearlite structure.	No significant defect. Monitor after five years.
30	105-D Synthesis Converter. At circumferential weld below top manhole.(Silo side towards north.)	SA 387 .	Microstructure show ferrite and carbides in dendrictic form. Disintegration of carbide was initiated.	Level II degradation. Monitor after three years.
31	105-D Synthesis Converter. At circumferential weld below top manholc.	SA 387	Microstructure show ferrite and carbides in dendritic form. Disintegration of carbide was initiated.	Level II degradation. Monitor after three years.
32	105-D Synthesis Converter shell. At circumfcrcntial weld at first platform opposite to 123-C	SA 387 .	Microstructure show ferrite and carbides in dendritic form.	No significant defect. Monitor after fivc ycars.
33	105-D Synthesis Converter. At 3rd circumferential weld from bottom. opposite to 123-C	SA 387	Microstructure show ferrite and carbides in dendritic form.	No significant defect. Monitor after five years.

CODE NO JOB DESCRIPTION

SR. NO.	EQUIPMENT	MATERIAL	OBSERVATIONS	COMMENTS
34	Pipeline SG-33-14" (122-C to 123-C) On bend opposite to 112-F	2.25 Cr 1 Mo A-335 GRP22	Microstructure show ferrto- bainitic structure. Disintegration of bainite was observed. Oriented creep cavities are observed.	Level I degradation. Approaching 3rd stage creep damage. Monitor after three years.
35	Pipeline SG-33-14" (122-C to 123-C) On weld of bend opposite to 112-F	2.25 Cr 1 Mo A-335 GRP22	Microstructure show essentially ferritic structure with carbides. Initiation of creep cavities are observed.	Level II degradation. Approaching 2nd stage creep damage. Monitor after three years.
36	Pipeline SG-33-14" (122-C to 123-C) On bend at 122-C top.	2.25 Cr 1 Mo	Microstructure show ferritic structure with degraded bainite. Oriented creep cavities are also observed.	Level II degradation. Approaching 3nd stage of creep damage. Monitor after two-three years.
37	Pipeline SG-33-14" (122-C to 123-C) On weld of bend towards 122-C at top.	2.25 Cr 1 Mo	Microstructure show ferrito-bainitic structure.	No significant defect. Monitor after five years.
38	Pipe line SG-32-6" (102-B to 105-D)On bend of line coming from 102-B(SG-62 A/B to SG-25)	5 Cr Steel A-335 GRP5	Microstructure show ferrito-bainitic structure. Degradation of bainite was observed.	Level II degradation. Monitor after three years.

CODE NO JOB DESCRIPTION

SR. NO.	EQUIPMENT	MATERIAL	OBSERVATIONS	COMMENTS
39	Pipe line SG-32-6" (102-B to 105-D)On line from 102-B & MIC13to105D (SG-62 A/B to SG-25)	5 Cr Steel A-335 GRP5	Microstructure show ferrite and carbides	Level III degradation. Monitor after one year.
40	Pipe line SG-32-6" (102-B to 105-D)At reducer on line from 102-B & MIC13to105D (SG-62 A/B to SG-25)	5 Cr Steel	Microstructure show ferrito-bainitic structure. Degradation of bainite was observed.	Level II degradation. Monitor after three years.
41	104-C, Methanator Feed Preheater On circumferential weld on shell	SA204 Gr.C C-1/2Mo	HAZ Microstructure show essentially ferritic structure with carbides.	Level II degradation. Monitor after two-three years.
42	104-C, Methanator Feed Preheater At 1st bend on line 104-C to 112-C.	Carbon Steel	Microstructure show ferrite-pearlite structure. In-situ spherodization of pearlite was observed.	Level I degradation. Monitor after five years.
43	On PG-4-24" (Mixing Tee)	Cr-Mo Steel P-11	Microstructure show ferrite-pearlite structure. Spherodization of pearlite was observed. Presence of creep cavities and micro cracks are observed.	Level III degradation Approaching 3rd stage of creep damage. Replacement required.

CODE NO JOB DESCRIPTION

SR. NO.	EQUIPMENT	MATERIAL	OBSERVATIONS	COMMENTS
44	On PG-4-24" (Mixing Tee) after 0.5 mm grinding.	Cr-Mo Steel P-11	Microstructure show ferrite-pearlite structure. Sphcrodization of pearlitc was obscrvcd. Prcscncc of creep cavities and micro cracks are observed.	Level III degradation Approaching 3rd stage of creep damage. Replacement required.
45	PG-4-24" (Mixing Tee)	Cr-Mo Steel P-11	Microstructure show essentially ferritic structure. Presence of creep cracks are noticed at grain boundaries.	Approaching 3rd stage of creep damage. Replacement required.
46	PG-4-24" (Mixing Tee) after 0.5 mm grinding.	Cr-Mo Steel P-11	Microstructure show essentially ferritic structure. Presence of creep cracks are noticed	Approaching 3rd stage of creep damage. Replacement required.
47	PG-4-24" (Mixing Tee) near weld on line coming from TRCV-10	Cr-Mo Stccl P-11	Microstructurc show fcrritc and carbidcs. Oricntcd creep cavities and cracks are noticed	Lcvcl III degradation. Approaching 3rd stage of creep damage. Replacement required.
48	102-C Secondary Waste Heat Boiler. On shell just below flange at upper end.	11/4 Cr 1/2Mo	Microstructure show ferrite-pearlite structure	No significant defect. Monitor after five years.
49	102-C Secondary Waste Heat Boiler. Near flange at lower end.	11/4 Cr 1/2Mo	Microstructure show ferrite-pearlite structure	No significant defect. Monitor after five years

CODE NO JOB DESCRIPTION

SR. NO.	EQUIPMENT	MATERIAL	OBSERVATIONS	COMMENTS
50	104-D IITS and LTS. On HTS outlet line bend .	Cr-Mo Steel P-11	Microstructure show essentially ferritic structure. Micro cracks are observed at grain boundaries.	Approaching 3rd stage of creep damage. Monitor after one year.
51	104-D HTS and LTS. On outlet piping weld HAZ between bend and vertical pipe going to 103-C	Cr-Mo Steel P-11	Microstructure show essentially ferritic structure with creep cavities and micro cracks at HAZ	Approaching 3rd stage of creep damage. Monitor after one year.
52	104-D HTS and LTS. On LTS outlet pipe	Carbon Steel	Microstructure show ferrite-perlite structure.	No significant defect.. Monitor after five years.
53	Pipeline BW-45HA/HB (Riser of 101-CB to 101-F) On the bend of Y-junction	Carbon Steel	Microstructure show ferrite-pearlite structure. Initiation of spherodization of pearlite was observed.	Level I degradation. Monitor after three years.
54	Pipeline BW-45HA/HB (Riser of 101-CB to 101-F) On the pipe surface before weld of Y-junction	Carbon Steel	Microstructure shows ferrite and carbides in dendritic form.	No significant defect. Monitor after five years.
55	Pipeline BW-45HA/HB (Riser of 101-CB to 101-F) On the surface of Y-junction	Carbon Steel	Microstructure show ferrite-pearlite structure	No significant defect. Monitor after five years

CODE NO JOB DESCRIPTION

6. 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.

SR. NO	LINE NO	FROM	TO	NOS. OF JOINTS EXAMINED
1	A-21-10"	A-20	A-21	04
2	BF-2H-6"	BF-17	BF-2H	02
3	BW-45HA/HB-12"	BW-1H	101-F	11
4	HS-4-12"	HS-3H	HS-7	02
5	MS-9-10"	MS-12	MS-2	02
6	MS-23-8"	MS-60	104-J	03
7	MS-24-8"	MS-60	104-JA	06
8	MS-29-12"	MS-2	NG-8	04
9	MS-40-8"	MS-2	HEADER	02
10	MS-60-10"	MS-2	HEADER	02
11	NG-11A TO H- 6"	NG-9	101-B	16
12	PG-6-16"/18"	104-D	103-C	02
13	103-D Secondary Reformer Cone Weld joints	Longitudinal weldjoints		01
14	105-D Synthesis Gas Converter	Circumferential weldjoint at 1st and 3rd platform elevation		02

7. ULTRASONIC THICKNESS MEASUREMENT:

During the shutdown, ultrasonic thickness measurement was carried out on various pipelines and equipment in the plant. The detailed results of inspection are attached herewith at Annexure-8 (for equipment) and Annexure-9 (for pipelines).

8. REPLACEMENT OF PIPELINES:

During this shutdown, various pipelines in Ammonia Plant were replaced by Technical Group. Inspection activities viz. DP Test, Radiography review and repairs etc. were carried out on the weld joints as per fabrication procedures. Radiography work was kept in the scope of Inspection Section to speed up the radiography work and the results.

CODE NO JOB DESCRIPTION

9. **OVER SPEED TRIP TEST:**

Before startup, during over speed trip test, speed measurement and vibration measurement of BFW pump Turbine,104JAT, Air Compressor Drive Turbine 101-JT were carried out.

ANNEXURE-1

VISUAL INSPECTION REPORT OF PRIMARY REFORMER RADIANT ZONE

1) BURNER BLOCKS:

a) Burner blocks found badly damaged :-

214,312,505,507,508,509,601,614,704,713,811,813,904,905,906,912.

2) BOTTOM HEADER INSULATION:

Row No.	Location of header insulation damage/ partial layer damage
1	Below tube no. 6,7,9,18,19,30,31,38,,39.
2	Below tube no.1,2,6,7,18,,19,39,40,41.
3	Below tube no 2,3,24,25,37,38,
4	Bclow tubc no 2,3,11 to 15,17 to 21,29,30,32 to 36,39 to 42.
5	Below tube no. 4,5,6,12,13,14,23,24,40,41.
6	Below tube no. 1,2,14,15,17 to 20**,29,30.
7	Below tube no. 9,10,11,17,23,24,25,34,35.
8	Below tube no. 1 to 7**,17,18,22,23,25,26,32,33,40.

** Header was found exposed due to damage to the insulation in this area.

CODE NO JOB DESCRIPTION

3) ROOF INSULATION:

In general, the condition of the roof insulation was found to be satisfactory. However, at few locations small segments of the ceramic fiber insulation blocks had got detached causing exposure of roof plate to the flame/flue gases. In rest of the areas mentioned below, the ceramic fiber modules have got loosened which needed corrective action.

TUBE ROW NO.	LOCATION OF DAMAGE
1	Between tube no. 1,2,6 to 10,14 to 32
2	Between tube no. 2,3,7,8,10,11,12,23,24,28,32,33,36,37,40 to 42
3	Between tube no. 4,5,26 to 29,30 to 33, 36 to 42.
4	Between tube no. 2,3,16,17,19,20,28,29,32,33,40 to 42
5	Between tube no. 3 to 12,37 to 42
6	Between tube no. 1,2,7 to 10,14,17,18,31,32,36,37
7	Between tube no. 1 to 10,11,12,20,21,23 to 26, 28 to 42
8	Between tube no. 1 to 7,16 to 18,24 to 26,37 to 42

4) ROOF INSULATION AROUND BURNER BLOCKS :

ROW NO.	LOCATION OF DAMAGE.
1	Around burner block no. 1,7,8,10,13
2	Around burner block no. 1,2,4,6,8,9,14
3	Around burner block no. 1,2,6,7,12
4	Around burner block no. 1,3,7
5	Around burner block no. 1,3,4,5,6,7,8,10,14
6	Around burner block no. 1,3,5,6,7,8,9,12,13,14
7	Around burner block no. 1,4,5,7,8,9,12,13
8	Around burner block no. 3,5,6,8,11,12,13
9	Around burner block no. 4,5,6,8,9,10,11,12,14
	Canister base ring of riser found distorted for row nos. 1,3,7 and 8

CODE NO JOB DESCRIPTION

5) REFRACTORY WALLS:

WEST WALL:-

1. Crack openings of about 1 to 1.5 feet length observed on south end i.e. 5 meters above from tunnel floor at 2 locations.
2. Bricks found displaced/loose at one feet height from tunnel slab elevation through out the length of west wall.
3. Cerafelt packing was required to be filled wherever required on openings of expansion gap between brick panels
4. Inward bulging was observed on 3rd and 4th panel column from south end , 2nd course from tunnel slab elevation.
5. Outward displacement of the two panels was observed .These panels are located at the north end , first and second from top.
6. Ceramic fiber blanket was found loose/displaced on north end top corner.

EAST WALL:-

1. Bricks found displaced/loose at about one foot height from tunnel slab elevation through out the length of east wall.
2. Brick panel around both manholes was found loose.
3. Cerafelt packing were required to be filled wherever required on openings of expansion gap between brick panels.
4. Ceramic fiber blanket of top course found partially damaged particularly opposite burner block no.6,8,10,11,12,13,and 14.

   Crack openings on brick panel observed on 3rd course from bottom i.e at peephole no. 9 location.

CODE NO	JOB DESCRIPTION

NORTH WALL :-

1. Brick panel lining around bottom peephole nos 1 to 9 as well as on tunnel slab elevation and also near top peephole no1 & 4 was loose.

2. Crack openings in brick lining vertical direction observed on 2nd course from bottomi.e below top peephole no.4.

3. 3 Inward bulging observed on 3rd course panel from bottom i.e near top peephole no.6.

4. Brick panel found loose on 1st course above tunnel slab row no.7.

SOUTH WALL:-

1. Ceramic fiber blanket found to have minor damage just at tunnel slab locations on almost all the rows.

2. Bricks found displaced/loose around top peephole nos 4, 5 & 6 and also just below top peep hole no5.

3. Ceramic fiber blanket found partially damaged above top peephole no 9 on east end top corner.

CODE NO JOB DESCRIPTION

PDIL INVESTIGATION REPORT :

ANNEXURE -2

GRADATION OF TUBES BY AUS

GRADE	ROW NO.	TUBE NOS.	NO OF TUBES	TOTAL TUBES
A	1 to 8	NIL	NIL	NIL
B	1 to 8	NIL	NIL	NIL
C1	1	6	1	04
	2	NIL	NIL	
	3	NIL	NIL	
	4	34	1	
	5	NIL	NIL	
	6	NIL	NIL	
	7	NIL	NIL	
	8	4+RISER	1+1	
C2	1	8,11,26,32,37,41 + RISER	6+1	51
	2	3,4,6,15,17,18,39 + RISER	7+1	
	3	30,32,35,42 + RISER	4+1	
	4	14,23,26,28,31,33,38 + RISER	7+1	
	5	9,29,32,40,42	5	
	6	16,19,21,22,23,26,37 + RISER	7+1	
	7	17,19,25,31,40 + RISER	5+1	
	8	1,2,7,10	4	
C3	1	1,2,3,4,5,7,9,10,12,13,14,15,16,17,18 ,19,20,21,22,23,24,25,27,28,29,30,31 ,33,34,36,39,40	32	
	2	1,2,5,7,8,9,10,11,12,13,14,16,19,20,2 1,22,23,24,2526,27,28,29,30,31,32,3	35	
	3	3,34,35,36,37,38,40,41,42	36	
		1,2,3,4,5,6,7,8,9,10,12,13,14,15,16,1 7,18,19,20,2122,23,24,25,26,27,28,2 9,31,33,34,36,37,39,40,41.		

CODE NO JOB DESCRIPTION

PDIL INVESTIGATION REPORT :

ANNEXURE -2

GRADATION OF TUBES BY AUS

GRADE	ROW NO.	TUBE NOS.	NO OF TUBES	TOTAL TUBES
C3	4	1,2,3,4,5,6,7,8,9,10,11,12,13,15,16,17,18,19,20,21	34	276
	5	22,24,25,27,29,30,32,35,36,37,39,40,41,42	37+1	
	6	1,2,3,4,5,6,7,8,10,11,12,13,14,15,16,17,18,19,20,	35	
	7	21,22,23,24,25,26,27,28,30,31,33,34,35,36,37,	36	
	8	38,39,41 + RISER	30	
		1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,17,18,20,24,2527,28,29,30,31,32,33,34,35,36,38,39,40,41,42		
		1,3,4,5,6,7,8,9,10,11,12,13,14,15,16,18,20,21,22,23,24,26,27,28,29,30,32,33,34,35,36,37,38,39,41,42		
		3,5,6,8,9,11,12,13,14,15,16,17,19,20,21,22,23,24,2526,27,29,32,33,34,35,37,39,40,41		
D	1	35,38,42	3	13
	2	NIL	NIL	
	3	11,38	2	
	4 to 6	NIL	NIL	
	7	2	1	
	8	18,28,30,31,36,38,42	7	

CODE NO JOB DESCRIPTION

ANNEXURE : 3(1/4)

CREEP MEASUREMENT OF PRIMARY REFORMER CATALYST TUBES :

TUBE NO	CREEP IN PERCENTAGE				TUBE NO	CREEP IN PERCENTAGE			
	0	0-0.73	0.73-1.3	1.3-2.5		0	0-0.73	0.73-1.3	1.3-2.5
101		X			201		X		
102	X				202	X			
103		X			203	X			
104	X				204		X		
105	X				205		X		
106	X				206	X			
107	X				207	X			
108		X			208	X			
109	X				209	X			
110	X				210	X			
111	X				211	X			
112		X			212	X			
113		X			213		X		
114	X				214		X		
115	X				215	X			
116		X			216	X			
117		X			217	X			
118	X				218		X		
119	X				219	X			
120		X			220	X			
121		X			221		X		
122		X			222		X		
123	X				223		X		
124		X			224		X		
125		X			225		X		
126	X				226		X		
127		X			227	X			
128	X				228	X			
129		X			229	X			
130		X			230		X		
131		X			231	X			
132	X				232	X			
133		X			233	X			
134	X				234	X			
135		X			235	X			
136		X			236		X		
137	X				237	X			
138		X			238		X		
139		X			239		X		
140		X			240	X			
141		X			241	X			
142		X			242	X			
TOTAL	18	24			TOTAL	26	16		

CODE NO JOB DESCRIPTION

ANNEXURE : 3(2/4)

CREEP MEASUREMENT OF PRIMARY REFORMER CATALYST TUBES :

TUBE NO	CREEP IN PERCENTAGE			
	0	0-0.73	0.73-1.3	1.3-2.5
301	X			
302		X		
303	X			
304	X			
305	X			
306	X			
307	X			
308		X		
309		X		
310	X			
311	X			
312	X			
313		X		
314	X			
315	X			
316		X		
317		X		
318		X		
319	X			
320	X			
321		X		
322		X		
323	X			
324	X			
325	X			
326	X			
327	X			
328		X		
329		X		
330		X		
331		X		
332		X		
333	X			
334		X		
335	X			
336	X			
337	X			
338	X			
339		X		
340	X			
341		X		
342		X		
TOTAL	24	18		

TUBE NO	CREEP IN PERCENTAGE			
	0	0-0.73	0.73-1.3	1.3-2.5
401		X		
402		X		
403		X		
404	X			
405	X			
406		X		
407	X			
408	X			
409	X			
410		X		
411		X		
412		X		
413	X			
414	X			
415	X			
416		X		
417	X			
418	X			
419	X			
420		X		
421	X			
422	X			
423	X			
424	X			
425		X		
426		X		
427	X			
428	X			
429	X			
430	X			
431	X			
432	X			
433	X			
434	X			
435	X			
436	X			
437	X			
438	X			
439		X		
440	X			
441	X			
442	X			
TOTAL	30	12		

CODE NO JOB DESCRIPTION

ANNEXURE : 3(3/4)

CREEP MEASUREMENT OF PRIMARY REFORMER CATALYST TUBES :

TUBE NO	CREEP IN PERCENTAGE			
	0	0-0.73	0.73-1.3	1.3-2.5
501		X		
502		X		
503	X			
504	X			
505		X		
506	X			
507		X		
508		X		
509		X		
510		X		
511	X			
512		X		
513	X			
514		X		
515		X		
516		X		
517		X		
518		X		
519		X		
520	X			
521	X			
522		X		
523		X		
524		X		
525	X			
526	X			
527		X		
528		X		
529		X		
530		X		
531		X		
532		X		
533		X		
534		X		
535	X			
536		X		
537		X		
538		X		
539		X		
540		X		
541		X		
542		X		
TOTAL	10	32		

TUBE NO	CREEP IN PERCENTAGE			
	0	0-0.73	0.73-1.3	1.3-2.5
601		X		
602		X		
603		X		
604		X		
605		X		
606		X		
607		X		
608		X		
609		X		
610	X			
611		X		
612		X		
613	X			
614		X		
615	X			
616		X		
617		X		
618		X		
619	X			
620	X			
621		X		
622		X		
623		X		
624		X		
625	X			
626	X			
627	X			
628		X		
629		X		
630		X		
631	X			
632		X		
633		X		
634		X		
635	X			
636		X		
637		X		
638		X		
639		X		
640		X		
641		X		
642	X			
TOTAL	11	31		

CODE NO JOB DESCRIPTION

ANNEXURE : 3(4/4)

CREEP MEASUREMENT OF PRIMARY REFORMER CATALYST TUBES :

TUBE NO	CREEP IN PERCENTAGE				TUBE NO	CREEP IN PERCENTAGE			
	0	0-0.73	0.73-1.3	1.3-2.5		0	0-0.73	0.73-1.3	1.3-2.5
701		X			801		X		
702		X			802		X		
703		X			803		X		
704		X			804	X			
705		X			805	X			
706		X			806		X		
707		X			807	X			
708		X			808		X		
709		X			809		X		
710	X				810		X		
711	X				811		X		
712		X			812		X		
713		X			813	X			
714	X				814		X		
715	X				815		X		
716		X			816	X			
717		X			817		X		
718		X			818		X		
719		X			819		X		
720		X			820		X		
721		X			821		X		
722		X			822		X		
723		X			823	X			
724		X			824		X		
725	X				825	X			
726	X				826		X		
727		X			827		X		
728	X				828		X		
729	X				829		X		
730	X				830		X		
731			X		831		X		
732		X			832	X			
733		X			833		X		
734	X				834		X		
735		X			835	X			
736	X				836	X			
737	X				837	X			
738	X				838	X			
739	X				839	X			
740	X				840	X			
741	X				841		X		
742	X				842		X		
TOTAL	17	24	1		TOTAL	14	28		

CODE NO JOB DESCRIPTION

ANNEXURE-4

CREEP MEASUREMENT OF RISER TUBES

RISER NO.	OUTSIDE DIAMETER		DESIGN O.D.	CREEP
	E-W	N-S	Max.	%
1	4.9435	4.9419	4.94	0.11
2	4.933	4.9319	4.94	NIL
3	4.9635	4.9638	4.94	0.52
4	4.9419	4.9455	4.94	0.15
5	4.9409	4.9309	4.94	0.04
6	4.9305	4.9339	4.94	NIL
7	4.9443	4.9474	4.94	0.19
8	4.9639	4.9625	4.94	0.52

NOTE : (1) All dimensions are in Inch.

(2) Maximum diameter of 4.9639" was observed which corresponds to 0.52 % creep.

CODE NO JOB DESCRIPTION

ANNEXURE-5

CREEP MEASUREMENT OF OUTLET MANIFOLD

Design Outside Diameter : 5.5945" (Max.)

HEADER NO.	LOCATION OF MEASUREMENT							
	A		B		C		D	
	X-X	Y-Y	X-X	Y-Y	X-X	Y-Y	X-X	Y-Y
1	5.5967	5.5962	5.5969	5.597	5.5947	5.6024	5.6046	5.6138
2	5.5954	5.5944	5.608	5.6062	5.6142	5.5968	5.5927	5.5902
3	5.5866	5.5978	5.5907	5.6023	5.5872	5.5963	5.5882	5.5932
4	5.6046	5.6068	5.5861	5.6042	5.586	5.5913	5.5835	5.5984
5	5.5952	5.6076	5.6124	5.6067	5.5885	5.5949	5.6062	5.5905
6	5.5828	5.6206	5.5955	5.5816	5.6035	5.6032	5.6034	5.6045
7	5.6045	5.6109	5.6079	5.6075	5.6077	5.6244	5.6067	5.6081
8	5.5988	5.5895	5.6001	5.6027	5.5936	5.5896	5.6091	5.615

Note : (1) All dimensions are in Inch.

(2) Maximum diameter of 5.6244" was observed which corresponds to 0.5 % Creep.

CODE NO JOB DESCRIPTION

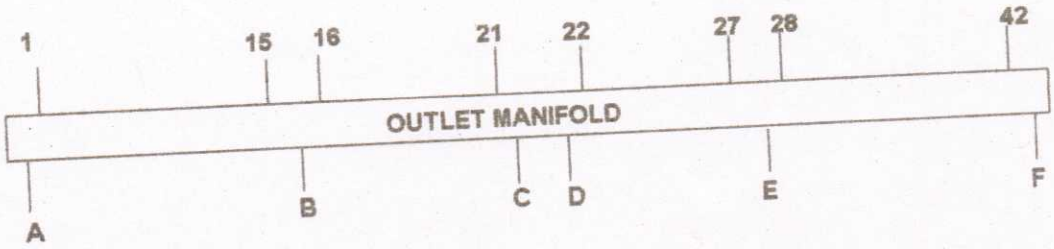
ANNEXURE-6

CLEARANCE OF OUTLET MANIFOLD FROM GROUND FLOOR IN COLD CONDITION

HEADER NO.	LOCATION OF MEASUREMENT					
	A	B	C	D	E	F
1	315	305	300	290	305	305
2	315	310	320	315	320	295
3	320	290	305	305	300	300
4	330	315	310	310	320	305
5	305	307	310	330	310	325
6	300	298	280	286	290	305
7	315	325	330	330	315	322
8	320	320	325	310	325	325

NOTE : (1) All readings are in MM

(2) Readings are taken without insulation.



CODE NO JOB DESCRIPTION

ANNEXURE-7

1. TUBE SPRING HANGER LOAD READINGS OF PRIMARY REFORMER HARP ASSEMBLY(101-B):

COLD LOAD READINGS IN MM :

ROW	TUBE NOS. (SOUTH TO NORTH)																				
	1	2 3	4 5	6 7	8 9	10 11	12 13	14 15	16 17	18 19	20 21	22 23	24 25	26 27	28 29	30 31	32 33	34 35	36 37	38 39	404 1	42
1	15	0	-8	-8	-6	0	-15	-15	-12	-11	-6	-6	-10	0	-10	-12	4	0	0	4	5	16
2	12	8	4	-3	-6	-8	-14	-7	-10	-11	-10	-8	-10	-10	-9	-7	0	-8	0	0	0	15
3	10	11	10	3	-8	-7	-7	-5	-6	-5	-8	-10	-11	-10	-6	-7	0	-6	0	8	10	-8
4	0	5	0	0	0	-14	-15	-10	-10	-8	-8	-10	-10	-11	-5	-16	-10	0	0	5	10	10
5	12	6	0	0	-6	-7	-14	-16	-10	-15	-8	-12	-8	-8	-10	-12	-10	0	-4	0	5	10
6	10	7	0	-8	-11	-15	-20	-18	-18	-15	-14	-10	-17	-16	-12	-11	-11	-8	-15	-7	0	10
7	8	0	5	0	-5	-8	-16	-15	-17	-15	-11	-10	-11	-12	-10	-15	-14	-5	8	6	6	8
8	10	4	0	0	-15	-17	-15	-14	-17	-8	-5	-10	-12	-11	-20	-17	-15	-14	0	10	7	6

2. TRANSFER LINE SPRING HANGER LOAD READINGS :

ROW	1	2	3	4	5	6	7
READINGS	8	7	7	8	0	6	5

3.BOTTOM DRAIN READINGS :

ROW	1	2	3	4	5	6	7	8
READINGS	30	25	32	38	20	30	25	45

*** ALL READINGS ARE IN MM.**

CODE NO JOB DESCRIPTION

ANNEXURE - 8

THICKNESS MEASUREMENT DATA FOR EQUIPMENTS

SR.NO.	EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	SHELL THICKNESS IN MM			DISH END THICKNESS IN MM		
			DESIGN	MEASURED MINI.	REDUCTION %AGE	DESIGN	MEASURED MINI.	REDUCTION
1	102 - B	Start up Heater (Tubes)	10	9.7	3			
2	122 - C	NH3 Converter Interchanger		5.8				
3	123 - C	NH3 Converter Feedwater Exchanger	82.55	108.4				
4	105- D	Synthesis Converter	NA	7.3		NA	87.8	
5	106 - D	Methanator	44.5	45.4		43.7	55.4	
6	104 - E	Condensate Stripper	12.5	11.5	8.8	11.1	13.8	
7	101 - F	Stream Drum	106.4	109.1		106.4	103.7	2.53
8	141-F	New Instrument Air Receiver	NA	10		NA	10.1	
9	142-F	New Instrument Air Receiver	NA	12.1		NA	11.2	
10	F-101	Naptha Deaerator		14.1				
11	R-110	Naptha Hydrogenator		31.8				
12	R-111	Sulphur Absorber	35	35.3		35(Min)	39.4(Top)	
13	B-201	Knockout Drum of Flair Stack	10	9.6	4	12	10	16
14	B-201	Water Seal Drum of Flair Stack	10	9.8	2	12	7.3	39.16
		COILS THICKNESS DATA	Tube designThk, mm	Measured Thk, mm	%ge reduction			
15		Offsite BFW Coil	5.54	4.4	20.57			
16		NG Feed Preheater Coil	3.9	3.7	5			
17		BFW Coil Ammonia	5.54	4.7	15.16			
18		LT Steam Superheater Coil	7	5.7	18.57			
19		Mixed Feed Coil	9.5	11.4	--			
20		Air Preheater Coil	10.16	21.3	--			
			6.55	6.1	6.87			
21		HT Steam Superheater Coil	8	6.3	21.25			
22		Auxiliary Boiler Coil	7.01	6.2	11.55			

CODE NO JOB DESCRIPTION

ANNEXURE-9

THICKNESS MEASUREMENT DATA OF AMMONIA PLANT PIPELINES, S/D APRIL 2002:

SR NO	LINE NO.	N.B. (in.)	SCH.	NOM.THK MM	MAT.	LINE DESCRIPTION FROM	TO	MIN THK. OBSERVED	% RED.	REMARK
1	A-20	10	20	6.35	C.S.	101 J	101 B	5.5(April01)	13.39	
2	aMDEA-02	4	40	6.02	SS-304	aMDEA-01	101-L	4.7(April01)	21.93	REPLACED SEP-93
3	aMdEA-09A	10	40S	9.27	SS	aMDEA-07	CON.VALVE	4.6(April01)	50.38	Part Repl. July-98(RECHECK)
4	aMdEA-09B	10	40S	9.27	SS	aMDEA-07	CON.VALVE	6(April01)	35.28	Replaced July-98(RECHECK)
5	aMDEA-25	2	80	5.5	CS	CONT. VALVE	ASSEMBLY	4.6	16.36	REPLACED IN APRIL99
6	BD-17	2	80	5.5	CS	109-F	GRADE	5.3	3.60	
7	BD-34	1.5	80	5.1	CS	103-D JKT	BD-35	4.6	9.80	
8	BD-35	1.5	80	5.1	CS	103-D JKT	DR-7	4.8	5.80	
9	BF-32	6	40	7.11	CS	101-U	123-J	6.5	8.58	
10	BW-22H	12	100	21.41	CS	COIL-A 101-B	101-F	19.9	7.05	UFD-FEB91
11	BW-23H	12	100	21.41	CS	COIL-B 101-B	101-F	20	6.50	UFD-FEB91
12	BW-24H	12	100	21.41	CS	COIL-D 101-B	101-F	20.4	4.72	UFD-FEB91
13	BW-25H	12	100	21.41	CS	COIL-E 101-B	101-F	20.2	5.65	UFD-FEB91
14	BW-28H	12	100	21.41	CS	COIL-C 101-B	101-E	20.2	5.65	UFD-FEB91
15	BW-32H	12	100	21.41	CS	101-F	COIL-C 101 B	20	6.59	UFD-APRIL-99, FEB-91
16	BW-33H	12	100	21.41	CS	101-F	COIL-D 101 B	19(APRIL98)	11.26	UFD-FEB91
17	BW-34H	12	100	21.41	CS	101-F	COIL-G-101 B	20.2	5.65	UFD-FEB91
18	CO-01A	18	30	11.13		102-EA	CO-17	9.5	14.65	
19	CO-01B	18	30	11.13		102-EB	CO-16	9.2(April01)	17.34	
20	CO-02A	18	30	11.13		CO-17	110-CA	10.5	5.66	
21	CO-02B	18	30	11.13		CO-16	110-CB	11	1.16	
22	CO-03A	18	30	11.13		CO-17	110-CA	9.8(April99)	11.95	
23	CO-03B	18	30	11.13		CO-16	110-CB	9(April99)	19.14	
24	CO-16	20	30	12.7		HEADER	CO2-B & CO3-B	12.3	3.15	
25	CO-17	20	30	12.7		HEADER	CO3-A & CO2-A	12.1	4.72	
26	HW-12	10	30	7.8	CS	128-C	HW-41	5.9	24.30	Replaced in April-98
27	HW-18	24	20	9.52	CS	110-CB	HW-16	8.7	8.60	
28	HW-19	24	20	9.52	CS	110-CA	HW-16	7.3	23.30	
29	HW-25	10	30	7.8	CS	124-C	HW-5	5.5	29.49	
30	LS-17	12	20	6.35	CS	LS-4	102-E	7.1		REPLACED IN APRIL1998
31	LS-17	14	20	6.35	CS	ORIFICE RUN		7		
32	LS-19	14	20	6.35	CS	ORIFICE RUN		6.9		
33	LS-19	12	20	6.35	CS	LS-4	102-E	7.2		REPLACED IN APRIL1998
34	MS-19	6	40	7.11	CS	MS-1	107-JAT	5.8(April01)	18.42	UFD JUN-97
35	MS-19	4	40	6.02	CS	CONTROL VALVE		5.4	10.29	
36	NG-04	6	40	7.11	CS	101-D	NG-6A	5.4	24.05	
37	NG-05	6	40	7.11	CS	102-D	NG-6A	6.2	12.80	
38	NG-06A	8	20	6.4	CS	NG-4	150-C	5.3	17.19	
39	NG-14	3	40	5.5	CS	NG-6	NG-15	5.8	–	
40	NG-15	4	40	6.02	CS	NG-7	S-11	5.9(April2k)	–	
41	NG-30	24			CS	NG-23	NG-23	9.4	1.30	

CODE NO JOB DESCRIPTION

SR NO	LINE NO.	N.B. (in.)	SCH.	NOM.THK MM	MAT.	LINE DESCRIPTION FROM	TO	MIN THK. OBSERVED	% RED.	REMARK
42	PG	1	80	4.55	CS	BYPASS LINE	SP5(PG-20-8")	3.2	29.67	
43	PG-08	20	STD	9.53	CS	104-C	112-C	9.3	2.30	REVIEW MRT=8.45; REPL APR 01
44	PG-09	18	STD	9.53	CS	157-F	104-D BOTTOM	8	16.00	Review MRT-8.45; Repl APR 2K
45	PG-13	16	30	9.53	SS-304	PG-26	106-C	8.8(April98)	7.61	REPL SEP93
46	PG-14	16	40	12.7	CS	106-C	102-F	7.8(JUNE97)	38.58	MRT=4.67 MM
47	PG-19	18	STD	9.53	CS	PG-8	PG-9	7.7	19.20	
48	PG-24	10	30	7.8	P-11	PG-17	PG-18	5.7	26.92	REPL SEP93,UFD APR-99
49	PG-33A	4	40	6.02	SS-304	105-CA	PG-34	4.8	20.20	REPL SEP93
50	PG-33B	4	404	6.02	SS-304	105-CE	PG-34	6.3(April98)	--	REPL SEP93
51	PG-34	6	40	7.11	SS-304	PG-33 A&B	PG-13	7	1.54	REPL SEP93
52	PW-04	2.5	160	5.16	SS	PW-1	106-J	3.8(April2K)	26.36	
53	PW-17	4	40	6.02	SS304	PW-1	170-C	4.5	25.25	
54	PW-20	6	80	10.97	CS	104-E	170-J	8.6	21.60	MRT= 0.42MM
55	PW-21	4	120	11.13	CS	170-J	170-C	10.3(APRIL98)	7.46	
56	PW-24	4	120	11.13	CS	173-C	CONTROL VALVE	5.1	54.18	MRT=0.29MM
57	PW-25	4	120	11.13	CS	CONTROL VALVE	BATT.LIMITS	9.9	11.05	MRT=0.29MM
58	PW-29	10	60	12.7	CS	171-C	PW-30	8.7	31.40	MRT= 0.68MM
59	PW-29A	10	60	12.7	CS	171-C	PW-30	8.7	31.40	MRT= 0.68MM
60	S-05	6	40	7.11	CS	S-7	HEADER	6.6	7.17	
61	S-07	6	40	7.11	CS	MS-34	S-5	6.4	9.90	
62	S-10	4	40	6.02	CS	S-7	S-13	5.7	5.32	
63	S-11	6	40	7.11	CS	S-5	104-O	6.4	9.99	
64	SC-07	2.5	80	7.01	CS	SC-42	101-JC	4.8	31.53	
65	SC-47A	10	40	9.27	CS	101-JC	112-J	5.9	36.35	
66	SC-47A	10	40	9.27	CS	101-JC	112-JA	5.7	38.51	
67	SC-47B	10	40	9.27	CS	101-JC	112-JB	5.8	37.43	
68	SC-50	1.5			CS	SPEC.BRK.	112-C	5	1.90	
69	SC-70	1.5	80	5.1	CS	SC-20	103-DJKT	4.2(JUNE97)	17.65	
70	SC-71	4	80	6.02	CS	SC-20	101-CA&B	7.1(JUNE97)		
71	SG-02	14	20	7.92	CS	114-C	115-C	7.3	7.80	
72	SG-13	12	100	21.41	CS	124-C	SG-14	19.2(JUN97)	10.32	UFD SEPT-93
73	SG-21	14	120	27.76	CS	121-C	SG-22 & 23	23.8(APRIL99)	--	UFD JUN-92,93,97
74	SG-25	8	120	18.24	CS	SG-23	CONT. VALVE	17.5	4.0	UFD APRIL-99,2K
75	SG-35	12	100	21.41	CS	121-C	103-J	20(APRIL98)	6.58	
76	SG-37	2.5	80	7.01	CS	125-C	108-F	5.6(APRIL2K)	20.11	
77	SG-55	3	80	7.62	CS	INST.SEAL VALVE	SG-11	20.5	4.20	
78	WA-01	36	7.93	7.93	CS	127-CA	WA-3	6.4(April99)	19.29	
79	WA-12	16	20	7.92	CS	WA-8	108-C2A	7.4	6.57	
80	WA-13	16	20	7.92	CS	WA-8	108-C2B	7.4	6.57	
81	WA-17	8	30	7.04	CS	WA-15	116-C	8.5(April99)	--	
82		1.5 / 2				120-J SUCTION AND DISCHARGE LINE		4.8/4.4		

CODE NO JOB DESCRIPTION

SR NO	LINE NO.	N.B. (in.)	SCH.	NOM.THK MM	MAT.	LINE DESCRIPTION FROM	TO	MIN THK. OBSERVED	% RED.	REMARK
83		1.5				H2 LINE FROM 104-F TO LTS FOR CATALYST REDUCTION		4		
84		2				103-J L.O. CONSOLE COIL INLET LINE		5.1		
85		2				101J/105J L.O. CONSOLE COIL INLET		5		
86		1.5				102-J L.O. CONSOLE COIL INLET LINE		4.5		
87		3				N.G. FEED PRE-HEATER COIL BYPASS LINE		5.4		
88		2				I.G. DERIMING HEATER STEAM INLET (LS) FROM E5 TO 156-F		4		
89		6		10.97		PRC 6 ABSORBER GAS INLET VENT LINE V-27		10.3	6.1	
90		10/2/10				LTS OUTLET VENT/INLET LTS/RV VENT		8.6/4.9/9.3		
91		4				101J DISC. MIX FEED COIL OUT FOR 101B CATALYST HEATING		4.5		
92		6/3				11ATA & 40 ATA STEAM LINE TO LTS 6"/HTS 3"		7.2/5.0		
93		2.5				MIC-12 VENT LINE TO 108-F		6.9		
94		3				ILS TO PRI. REF. FURNACE AS SNUFFING STEAM		5.4		

CODE NO JOB DESCRIPTION

SR NO	LINE NO.	N.B. (in.)	SCH.	NOM.THK MM	MAT.	LINE DESCRIPTION FROM	TO	MIN THK. OBSERVED	% RED.	REMARK
95		4		6.02		101J DISCHARGE LINE RV U/S LINE NEAR FRCV-3 (RV-5)		6.1		
96		6				LS TO PICV-15 U/S FOR PRI.REF. ARCH BURNER ATOMISING		7.1		
97			1.5			101 CA/CB GAS QUENCH LINE WITH BFW LINE		4.5(CS)/4.3(SS) 7.5/10.8		
98			2.5/3			101CA/CB COLD SHOT LINE INCLUDING U/S BFW LINE		5.4		
99			2.5			CW TO 103D, 101 CA/CB JACKET WATER HOOKUP LINE		5		
100			4			11 KG STEAM LINE UP TO 101-D/ 102-D		6.8		
101			6			PIC-1011 D/S VENT LINE		8.4/8.4		
102			2.5			104 J/JA (ARV/NRV) D/S LINE TO 101-U		5.3		
103			3		11.13	101 U DRAIN AND OVERFLOW LINE				54
104	Inst Air Line		2.5			142-F	141-F	3.8		
105	Inst Air Line		2.5			142-F	WATER SEPARATOR	3.5		
106	Inst Air Line		2.5			WATER SEPARATOR	NEAR 101-J	3.8		
107			1.5			THIC-131 U/S LINE FOR AUX. BR. ATOMIZING STEAM		6.3		
108	A.G.Line		8/6			151-C	PRC-2(101B)	7.0/6.9		

CODE NO JOB DESCRIPTION

SR NO	LINE NO.	N.B. (in.)	SCH.	NOM.THK MM	MAT.	LINE DESCRIPTION FROM	TO	MIN THK. OBSERVED	% RED.	REMARK
109		2.5/3				STEAM INLET LINE TO 151-C/150-C HEADER	AUX. BOILER ATOMISING	5.3/8.6		
110	38kg line	4/2.5				K-1(PIC-178)	FLARE	4		
111	PGR K-1 Vent d/s line	2				K-1(PIC-178)	IG LINE	4		
112	PGR K-1 Vent d/s line	2				K-1(PIC-178)	FUEL HEADER	5.2		
113	PGR K-1 Vent d/s line	1.5				THIC-131 TO AUX.BOILER ATOMISING		6.5		
114		1.5				V-25 RECYCLE OF 103-J VENT LINE		6.7/9.6		
115		3/4				103J RECYCLE RV U/S & D/S LINE		6.9/5.8		
116		3/4				FICV-8 U/S		7.8		
117		4				FICV-8 D/S		7.4		
118		4				FICV-7 UP STREAM		5.6		
119		4				105-J KICK BACK QUENCH LINE		4.7/4.5		
120		2/2.5				FICV-10 U/S		5.9		
121		12				FICV-10 D/S		6		
122		12				FICV-11 U/S		5.9		
123		12				FICV-11 D/S		5.6		
124		12				FICV-13 DOWN STREAM LINE UPTO FUEL HEADER		5.5/5.6		
125		4/6				AIR COIL BYPASS LINE (101B CONVECTION ZONE)		8		
126		4								

PLANT TURNAROUND - MARCH - APRIL - 2002

AMMONIA PLANT

CIVIL JOBS

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

(A) AUXILIARY BOILER :

(a) Replacement of burner block for burner no-3 and 1.
(b) Repairing of burner block for burner no. 4 and 5
(c) Repairing of Header and other refractory work inside auxiliary boiler.

(B) PRIMARY REFORMER :

Replacement of insulation brick along with back up insulation was carried out after removed of old damaged refractory in following area.

a) Below tunnel block level on entire North wall & one panel of 2.20 x 2.0 mt at the 4th panel level.

b) On East and West side wall (about 14 x 0.4 meter) just above tunnel block level.

c) On west wall - two pannel on extreme top level (on northen end)

(C) SECONDARY REFORMER :

(a) Repairing of cracks developed inside the secondary reformer carried out by department.

(D) WASTE HEAT BOILER :101-CA and 101-CB :

Damage refractory of waste heat boiler. Between outer cell and inner incoloy plate was repaired in bottom and on sides (below the inlet from secondary reformer).Material used was Tabcast 97 'L'/

PLANT TURNAROUND - MARCH - APRIL - 2002

AMMONIA PLANT

ELECTRICAL JOBS

CODE NO	JOB DESCRIPTION

01 61 01 ELECTRICAL JOBS :

1. Maintenance job carried out on following transformer: TR-6

   a) Inspection of primary and secondary cable boxes, end termination, checking and tightening of connection.

   b) Insulation resistance measurement of winding in primary and secondary side.
   c) Filtration of oil
   d) Checking of marshaling box and measurement of breakdown value of oil.

2. Preventive maintenance of all the feeder compartment in MCC 5, MCC 13 and MCC 16 were carried out.:

   a) Checking the tightness of outgoing terminal.
   b) Cleaning the feeder compartment.
   c) Replacement of damaged/ worn out contacts, etc.

3. Testing and calibration of all the relays installed on the feeder .

4. Overhauling of following motors were carried out:

   106J, 104J, 104JA, 104JAT, 104JT, 101BJT, 102JA, 102J, 107 BJT, MP110B,104 JAT, MP111B, 170J, 107JA, 103J

5. Preventive maintenance of following MOV were carried out : SP1, SP3, SP4, SP5, SP70, SP71, SP151, SP152, SP153, SP155, SP156 , SP 158 & SP159 .

6. Normal/ emergency power is provided to PGR motors P-1& P-2.

7 Modification of 170J and 170 JA motors terminal boxes carried out in view of convenience in power cable connection.

PLANT TURNAROUND - MARCH - APRIL - 2002

AMMONIA PLANT

INSTRUMENTATION JOBS

CODE NO	JOB DESCRIPTION

01 71 01 CONTROL VALVE : MAINTENANCE JOBS:

1) FICV-16, FICV-17: Valves were dropped from line, replaced new Plug and seat (with reduced Cv 44), carried out the gland packing and checked the tight shutoff and stroke of the valve. The control valve taken in line.

2) PICV-13 A / PICV-13 B : Changed gland packing and replaced the copper tubing connections to 1/4" SS tubing. Valve positioner cleaned and stroke checked.

3) MICV-32: Machined plug & seat. General cleaning, overhauling were carried out and checked the stroke.

4) MICV-29: Replaced I/P converter by a new one. General cleaning, overhauling were carried out and checked the stroke.

5) MICV-30: Opened the valve and overhauled. Replaced air regulator and checked the stroke.

6) LCV-13: Technical Dept. installed the new Instrumentation Limited, Palakkad make LCV-13 control valve in 106 F. For this Valve new instrument tubings for air supply, input and output etc. were carried out. Checked the stroke and found OK.

7) FRCV-3 : Opened control valve actuator and inspected diaphragm, found OK. Gland packing and overhauling were carried out and checked the stroke.

8) MICV-56 : Dropped from the line and overhauled the positioner and general cleaning carried out.

9) MICV-57 : Dropped from the line and overhauled the positioner and general cleaning carried out.

10) FRCV-5: General cleaning, overhauling and positioner replacement were carried out and checked the stroke.

11) FIC-202 : Provided new bonnet stud and positioner and overhauling were carried out and checked the stroke.

CODE NO JOB DESCRIPTION

12) MICV-61 : Control valve dropped from line provided new stud and positioner lever. Gland packing and stroke checking were carried out.

13) PICV-18: Changed air regulator of I/P converter and checked stroke after the general cleaning.

14) MICV-6 : Control valve hand wheel assembly repaired, overhauling carried out.

15) LCV-2A :Replaced new Plug and stem after the general cleaning and checked stroke.

16) FICV-13: Replaced I/P converter gauge after the general cleaning and stroke checked.

17) Following control valves (total 62) were painted.

1.	LCV-18	20.	MICV-61	39.	LCV-5	58.	MICV-28
2.	LCV-16	21.	PRCV-1	40.	PICV-17	59.	MICV-5
3.	MIC-12	22.	LCV--26	41.	PICV-5	60.	FICV-7
4.	PRCV-25	23.	LCV-25	42.	TRCV-12	61.	PRCV-24
5.	LCV-12	24.	Cold shot-1	43.	LCV-17	62.	TRCV-10
6.	PICV-8	25.	Cold shot-2	44.	TRCV-11		
7.	PICV-7	26.	MICV-10	45.	MICV-19		
8.	FICV-19	27.	LCV-19	46.	V-4		
9.	LCV-15	28.	V-7	47.	V-5		
10.	PRC-4	29.	FRCV-5	48.	LCV-17		
11.	FRC-205	30.	LCV-3B	49.	V-6		
12.	FRCV-3	31.	MICV-11	50.	101U over flow		
13.	PICV-44	32.	TRCV-142	51.	MICV-32		
14.	ARC-3	33.	TRCV-142B	52.	MICV-		
15.	PRCV-2	34.	PICV-13A	53.	MICV-31		
16.	FRC-1	35.	PICV-13B	54.	MICV-7		
17.	THCV-131	36.	BFW	55.	MICV-30		
18.	PCV-181	37.	THICV-60	56.	MICV-6		
19.	PRCV-18	38.	PICV-20	57.	MICV-29		

18) FICV-14: Replaced I/P converter gauge after the general cleaning and checked stroke.

19) PIC-1016A : Opened this ball valve for sluggish operation, the positioner and I/P converter overhauled and calibrated and checked stroke.

20) PICV-28: Opened bonnet bottom flange and overhauled the plug/seat assembly and carried out the stroke check.

CODE NO JOB DESCRIPTION

21) LCV-23: Hand jack assembly was very tight. Overhauled and replaced hand wheel by a bigger size and made the operation smooth. Checked stroke.

22) New gland packing and general cleaning, stroke checking were carried out of the following control valves.

(a) TRCV-10 (b) FRCV-2 (c) PRCV-25 (d) PRCV-4 (e) MICV-61
(f) LCV-134 (g) LCV-8 (h) LCV-2 (i) V-7

23) General cleaning , greasing and stroke checking of following control valve were carried out.

a) PRCV-23 b)PICV-10 c)LC-10 d)LCV-2 e)V-15 f)LCV-2A g)PRC-18 h)TIIIC-13
i) PCV-181 j)LCV-20 j)PICV-4

24) General cleaning carried out of all PGR dryer ball valves, KV 120-1 to 8 . The feed back pneumatic limit switches going to the new PGR programmer panel overhauled and 4 Nos. Of the switches were replaced by new. The Local pneumatic panel cleaned.

25) Preventive maintenance of following control valves, as per the list, were carried out by doing general cleaning, greasing, positioner & I/P checking / overhauling, gland replacement / tightening, stroke checking etc. as per the job requirement.

FRCV-1, FRCV-2, FRCV-3, V-18, PRC13A/B, MIC-22, FICV-12, FICV-14, PRCV-25 LCV-13, FICV-7, FICV-8, FICV-9, FICV-10, FICV -11, FICV-15

01 71 02 COMPRESSOR HOUSE JOBS :

101-J Air compressor :

1) HIC-101J: Carried out general cleaning, overhauling of governor positioner Changed air regulator checked stroke.

2) All probes were removed/opened to facilitate Mechanical maintenance job and fixed back after physical inspection and setting the gap voltage. The following probes were replaced.

a) Probe for channel point No. 1V
b) Extension cable for channel point No.BV,BK,AV,AK,5V
c) Proximitor for acceleration probe.

CODE NO JOB DESCRIPTION

3) Removed all TI / PI to facilitate Mechanical maintenance job and fixed back after the physical inspection .

4) FRCV-3 solenoid valve SV-3 relocated and new tubing carried out.

5) A new socket for 101J Steam inlet temperature gauge thermowell installed.

102-J NG compressor :

1) All probes were removed/opened to facilitate Mechanical maintenance job and fixed back after physical inspection and set the gap voltage.

2) Checked the temperature points TR-3-33, TR-3-6, TR-3-7, TR-3-2. The TR-3-34 were found in open condition which were made proper.

3) TI-33, TI-34 were found open. These pad type thermocouple soldered and put in line.

4) The solenoid valve in the seal oil line were removed earlier as it was not required. Plugged the connection line.

103-J Syn. Gas compressor :

1) All probes were removed/opened to facilitate Mechanical maintenance job and fixed back after physical inspection and setting the gap voltage. The following probes were replaced.

a) Probe for channel point no BA, BB, 3V, 3H, 4V, 4H, 10A, 10B
b) Extension cable for channel point no 4V, 7V
c) Connector for channel point no AB, 4V, 6H

2) MIC-23: Carried out general cleaning, overhauling of governor positioner, checked stroke. The regulator replaced by new one. Checked the operation and found OK.

3) PRC-12 : checked stroke after general checking of air lock relay, replaced air regulator, positioner/piston cylinder, replaced air lock relay. Checked the operation and found OK.

105-J Ref. Gas compressor :

1) General cleaning, overhauling of governor positioner (PRC-9) was carried out and checked stroke. Checked the operation and found OK.

2) All probes were removed/opened to facilitate Mechanical maintenance job and fixed back after physical inspection and setting the gap voltage. Replaced the following probes.

A) Probe for monitor channel Point.No. DA, 4V, 6V, 6H
B) Extension for channel point no.3V

CODE NO JOB DESCRIPTION

800-J NG/AG Booster compressor :

1) All probes of compressor were removed/opened to facilitate Mechanical maintenance job and fixed back after physical inspection and setting the gap voltage.

2) Removed all the RTD elements and fixed back after completion of Mech. Works.

3) Checked the TTV open/close indication for its operation.

01 71 03 **FIELD INSTRUMENTS JOBS :**

1) Inspected all the tunnel thermocouple/thermowell. Replaced 3 tunnel T/C with its thermowell as the same were found punctured.

2) Instrument Air Dryer, air outlet flange opened for inspection and put back. This is to facilitate for the thickness measurement of the nozzle of the vessel B for the inspection staff.

3) Steam drum instruments (LIC-1, Eye-hye, PI-18, PRC-18, Level switches): General cleaning was carried out. The Electrode, No: (-9) was replaced by new one for the Eye-Hye level measuring system.

4) TI-1008 : T/C Replacement was carried out. The tip of the thermocouple is welded inside the vessel (II-110) with the tubes.

5) Instruments at 104JAT (BFW pump) removed and fixed back to facilitate mech. Work.

6) Compared/checked new spark plug procured recently with the existing plugs for H-110 pre-reformer. It is found OK.

7) Relocated the ID fan ring pressure gauge and associated tubing.

8) 104JBT steam inlet T/W removed for inspection and fixed back after mech. work completion.

9) Removed and reinstalled 103J lube oil console level TX to facilitate tech. Dept. Work.

10) MTI-103D : TI-103 T/C was opened and fixed back after inspection.

11) Air header was flushed at various points.

12) TI-102 (metal temperature) thermocouple was opened, replaced the T/W with T/C for the TI-102.after inspection.

CODE NO JOB DESCRIPTION

13) Replaced thermocouple of TI-120 for the secondary reformer.

14) TRC-142 : Removed old thermowell and provide new T/W and T/C

15) FRC-1017 : TX manifold replaced.

16)114C gas outlet T/C was removed and fixed back after mech. Job.

17)107J sealing steam: Provided a new 1/2" SS tubing as per requirement of mech.

18) TX impulse line, manifold of PDR-26, 27, 34, 35, 36, 37 were tightened for leakage.

19) Checked the calibration of LAL-122 (steam drum) by filling water and replaced mercury switch.

20) Provided sample tubing for the HTS and LTS.

21) Calibrated FI-53, jacket flow transmitter. Checked the indication in the DCS.

22) Following control valve tubing were removed and put back after completion of mech. work. V-4, V-5 , V-1, PICV-13A/B , MIC-22 , HIC-1005.

23) TI-46 and 47 : Provided T/W flange and replaced T/C head by new one.

24) FIC-9,10,11 : Relay , regulator cleaning and flushing were carried out.

25) FIC-12,14 : New tubings were carried out and removed old pneumatic TX.

26) PRC-25 : Relocated I/P converter.

27) PI-82: Installed new transmitter by replacing the old and calibrated for the range of 0-160 kg/cm2.

28) Provided high range pressure gauges for hydro test as per requirement of mech.and calibration checked for the six nos. of press.gauges of mech.for safety valve testing.

29) Trip circuit Checking of all the compressor (101J,102J,105J,103J,800J) was carried out.

30) Startup Heater: Ignitor system was checked and checked performance, found OK. and kept ready for plant start up.

31) Old copper tubing (670 kg), cable (1300 kg), conduit pipe etc. related to old instruments were removed from plant .

CODE NO JOB DESCRIPTION

32) Boiler inspection jobs: provided SS tubing and high range pressure gauge on HP pump and on steam drum as per requirement of boiler inspector.

33) FIC-7, FIC-8 : Replaced pneumatic TX to electronic smart and the loops were taken in DCS

34) Relocated PSH-81 (trip switch) to above the pipe line as the service is gas (Air).

35) FI-63 Electronic smart TX. Installed.

36) PRC-178: Tubing from I/P to valve and DCS configuration job was carried out.

37) PAL-66, PAL-67 of 104JT relocated.

38) PDI-130JC transmitter and pressure gauge of 101J relocated.

39) TI-106 BFW steam inlet T/W & TI-0085 of 101CA were removed for inspection and installed.

40) Relocated the regulators of the V-18, FIC-205 control valves.

41) Following ISO related quality affecting transmitters, Analyzer and temperature point (total 31 instrument) was calibrated.

PT-7, PT-8, PT-10, PT-28, PT-150, PT-5, PT-4 , PT-80, PT-62, PT-9, PT-36, FT-1, FT-2, FT-3, FT-100, TI-104E, AR-1, PT-1027, FT-1006, FT-1005, PT-846, TI -0117, TI-0007, TI-0011, TI-0026, TI-0039, TI-0036, TIC-1025, PT-501, PT503, PT-27

01 71 04 **FUJI MAKE UPS, 2X60 KVA** :

1) The preventive maintenance of UPSS was carried by M/s IL, Jaipur against the AMC. General cleaning, servicing and configuration of parameter checking were done.

2) UPSS to AVR Auto changeover was checked, found OK. Battery performance were checked by switching off input supply of both UPSS from MCC for 45 min. Twice. Conditions of the battery were found in good condition.

4) The ACDB in the Urea plant taken in line.

CODE NO JOB DESCRIPTION

01 71 05 CONTROL ROOM JOBS :

YBL DCS :

a) The preventive maintenance of DCS was carried by M/s YBL as per the AMC. All EFCD, EOPS , EFMS and Engineering stations circuit PCB cards were removed from cabinet/panel and cleaned. Overhauled the fans, cleaned the filter, panels and cabinets.

b) All the jobs related with AMC were attended. Checked the reduendancy for CPUs, MAC2 cards, power supplies and HF buses.

c) Defined new level control loops for (110F, 111F, 112F) LIC-16, LIC-18 , LIC-19 in the DCS using new electronic level TX.(Masoneilan make) and carried out the input wiring from field to DCS cabinet.

d) Defined new smart TX for NG compressor PT-302, PT-345, PT-359 PT-335, PT-300 in DCS and carried out the input wiring from field to DCS cabinet. Taken all the transmitters in line.

e) Defined new smart TX., 38 ata stem to 104JAT FR-104 in DCS and carried out the input wiring from field to DCS cabinet and taken in line.

f) Defined new smart TX. , LI-1, Diff. Pr. TX, for steam drum level measurement in DCS and carried out the input wiring from field to DCS cabinet.

g) Removed obsolete drum programmer of PGR dryer and installed new PGR solenoid valves cabinet for full DCS control of the dryer.

h) Prepared and loaded the sequence logic for PGR drier in DCS for full DCS control of dryer. The old system was with Drum programmer. Configured 13 new digital outputs in DCS for solenoid valve actuation. All the logic related to the dryer operation which were earlier controlled by the drum programmer were configured in the sequence table of the DCS. Taken this programmer in line.

HIMA PLC :

a) The preventive maintenance of HIMA PLC were carried out. Removed all card from all the four PLC station and put back after cleaning of cards, filters, fans, cabinet etc. Detailed report has handed over by M/s Chemtrol ltd to IFFCO.

CODE NO JOB DESCRIPTION

b) Upgraded the operating station and Event Sequence Recorder station for the HIMA PLC and the details are as below:

The old three IBM PCs with obsolete OS2 operating system (2 for operator station and 1 for event sequence recorder) were upgraded to new IBM Pentium-IV PCs with window NT Operating system. The old application Software Wizcon Version 5.25 was upgraded to Wizcon Version 7.16 which works under WIN NT environment. This modification is carried out as per the recommendation of M/S HIMA.

Checked the "Project" file of operator stations and carried out necessary correction to match all the images with old one. The "Project" file for event sequence recorder also checked and carried out necessary correction for annunciator message as required for the new.

c) Three new smart TX for PDSL-63,PDSL-65 and for FSL-84 (FRC-5) were installed by replacing the old switches PDSL-62, 63 (LP case seal oil) PDSL-65,66 (HP case seal oil) in 103J and FSL-84 for aMDEA pump, modification were carried out in the PLC by carrying out necessary changes in software and the input wiring.

d) Delay timer value of FSL-115 (PGR) changed from 5 to 10 sec. This is per the requirement of the production.

GE-Fanuc PLC

a) All Field termination were made proper at local panel and removed all unnecessary wiring in local panel Junction boxes. The PLC tested for redundancy at CPU and bus level from A to B and vise versa and found OK. PLC-A/B run indication was provided in the IIC annunciator for identification of controlling PLC in ammonia control room.

b) Laid down a 2.5 sq.mm cables from UPSS to local panel of the NG booster compressor to reduce the voltage drop. Checked the voltage availability at the local panel and found OK.

c) The preventive maintenance of GE-FANUC PLC were carried out. PLC was completely tested for redundancy at CPU and bus level from A to B change over and vise versa.

01 71 06 CAPITAL JOBS CARRIED OUT IN ANNUAL TURNAROUND :

1. Following electronic level trolls were installed as per the committee recommendations.

   (1) LC-16 (2) LC-18 (3) LC-19

2. Following alarm switches were replaced with new for better reliability.

   (1) LSLL-104 (2) LSHH-109 (3) LSLL-141

CODE NO	JOB DESCRIPTION

3. Following New Electronic smart type transmitters were installed for the operational requirement..

   FT-33, FT-40, FT-95, PT-79, PT-36 , PT-62 , PI-81, PT-82 , PT-8, PT-84, FI-63, FI-201

4. Following new smart TX were installed in NG compressor area

   PT-302 , PT-345 , PT-359 , PT-335 , PT-300

5. Following differential pressure were replaced by Electronic smart TX and configured in PLC.

   PDSL-62/63, PDSL-65/66, FSL-84

6. Installation and commissioning PGR Dryer program panel by the replacement of obsolete Drum Programmer.

PLANT TURNAROUND - MARCH - APRIL - 2002

AMMONIA PLANT

TECHNICAL DEPARTMENT JOBS

CODE NO	JOB DESCRIPTION

01 81 01 **TECHNICAL DEPARTMENT JOBS:**

(A) MECHANICAL JOBS :

(1) Replacement of LO / SO Coolers (101 / 105 JLC) for Air Compressor / Refrigerant Compressor (101-J / 105-J) :

Old three nos. Lube oil cooler & extra lube oil circulation pump with motor removed and replaced with one set of new twin low fin. Lube oil coolers. Thermal & mechanical design and fabrication of new coolers are done by M/s Patel Air Temp(India)Ltd. During installation lube oil console was cleaned and 30 drums of fresh and 10 drums of old servo press 68 oil charged .Material of Oil line changed from carbon steel to SS-304.

	Shell side	Tube side
Fluid circulated	Oil	C.W
Design Pressure (Kg/Cm^2g)	13.6	10.5
Design Temp (Deg.C)	150	150
Hyd.Test pressure (Kg/Cm^2g)	17.68	13.65

Drg. No. : PR 1462-sh. 1 of 1-Rev. 3 of M/s. Patel Air Temp

(2) Replacement of LO/SO Coolers (103 - JLC) for Syn gas Compressor (103 - J) :

Old one set of Lube oil cooler removed and replaced with one set of new twin low fin. Lube oil cooler. Thermal mechanical design and fabrication of new coolers is done by M/s. Patel Air Temp(India)Ltd. During installation lube oil console was cleaned and 35 drums of fresh servo prime 32 Oil charged. The material of oil line changed from carbon steel to SS -304.

	Shell side	Tube side
Fluid circulated	Oil	C.W
Design Pressure (Kg/Cm^2g)	13.6	10.5
Design Temp (Deg.C)	150	150
Hyd.Test pressure $9Kg/Cm^2g$)	17.68	13.65

Drg. No. : PR 1463-sh. 1 of 1-Rev. 3 of M/s. Patel Air Temp

CODE NO	JOB DESCRIPTION

3) **Replacement of Line PG - 7 - 12'' from 103 - C to PG - 6 - 18"**

Material of this line upgraded from A335 P1 to A335 P11
Line Size - 12" NB x Sch - 30, Material - A 335 P11 Approx. Length - 18 mtr
As per Drg. No. -01-DL-13475

4) **Replacement of Line RV-52-1.5'' going from SC-19-14" to RV- 106-F.**

Line Size - 1 1/2" NB x Sch -160, Material - A 106 Gr. B Approx. Length - 10 mtr
As per Drg. No. -01-DL-13456

5) **LCV - 13 Replacement & its loop modification near 106-F**

New control valve procured from instrumentation Ltd., by instrument section is installed to new position by changing piping layout.
Size: 50mm NB X Sch.160, Material : A106 Gr.B
As per Drg. No. -01-DL-13404

6) **Diversion of Seal Oil off - Gases from seal oil traps of 103-J to NGBC suction.**

Tapping taken from a point in between two orifices on LP case off gas line and connected to NG line at upstream of suction knock out drum at NGBC.
Size:40mm NBXSch80, Approx. Length - 75mtr, Material: A106Gr.B
As per Drg. No. -01-DL-13459

7) **New Line laying from 6" A.G. To utility header to 6''-FG-180.01-B24**

Tapping from AG to utility header at the downstream of oil seperator 178-F taken and connected to existing 150mm NB tail gas line for use of AG for deareation.
Size:150mm NBXSch40 , Approx. Length - 7mtr, Material: A106Gr.B
As per Drg. No. -01-DL-13468

8) **New Line from 6''-FG-1101.01-B24 to 3''-NG-1102.01-D24 & 80mm new by pass line of HV-1103.**

This new line facilitate the use of AG for heating of R-110 & R-111 in pre-reformer section.
Size:150mm NBXSch40 & 80mm NBxSch.40 , Approx. Length - 15mtr, Material: A106Gr.B
As per Drg. No. -01-DL-13465

9) **Line from 6''-FG.180.01-B24 to flare stack vent in pre-reformer.**

New 40Mmm NB tail gas line taken from existing tail gas header and connected tail gas flare stack header.
Size:40mm NB X Sch40, Approx. Length - 60mtr, Material: A106 Gr.B
As per Drg. No. -01-DL-13468

CODE NO	JOB DESCRIPTION

10) **Mixing of hot and cold ammonia before going to 109-F.**

Cold ammonia tapping taken from line MA-1121-50-C4 and connected to hot ammonia line NH-14-150 downstream of ammonia condensers. Approximately 3 meter portion of NH-14-6''after isolation valve line changed from carbon steel to SS304.
Size:50mm NBXSch40 &150mm NBXSch40 ,Approx. Length - 20mtr, Material: A312TP304
As per Drg. No. -01-DL-13461

11) **Removal of lines:**

a) Additional cooling water supply & return lines(200NB size) from 173-C to main header were removed.
Approx. Length : 50meter. As per Drg. No. -01-DL-13467

b) AG Booster compressor bypass line with check valve.
Size:300NB & 250NB. As per Drg. No. -01-DL-13470

12) Piping for heat recovery from boiler blowdown drum (Suggestion scheme)
Size:50NBXSch.40 X Length 20meter(Approx.), material : A106 Gr.B
As per Drg. No. -01-DL-13469

13) Jumpover between 173-C & main cooling water supply lines.
Size:200NBXSch.40, Length approx.10meter. Material : A106 Gr.B
As per Drg. No. -01-DL-13466

(B) <u>INSTRUMENTATION JOBS :</u>

1) Provided two thermowells with temp. Gauges of range 0 to 250 degree centigrade & one pressure gauge of range 0 to 10 Kg/Cm2 with isolation valve for heat recovery scheme from blow down water of boiler blow down drum.

2) LCV-13 control valve tubing job completed.

PLANT TURNAROUND - MARCH - APRIL - 2002

UREA PLANT

MECHANICAL JOBS

CODE NO	JOB DESCRIPTION

02 01 01 CO2 CENTRIFUGAL COMPRESSOR (HITACHI) TRAIN K-1801 HP/LP CASE AND Q-1801 :

(A) PREVENTIVE MAINTENANCE OF HITACHI COMPRESSOR K-1801 H.P.CASE :

a) Couplings between the Gear Box to HP Compressor was decoupled after recording the nccccssary match marks.
b) Initial alignment readings were measured and recorded.
c) Coupling end bearing was removed after measuring the thrust bearing clearance/float.
d) Radial bearing clearances were measured by using lead wire and recorded.
e) Thrust bearing and the radial bearings assembled, clearance checked and recorded.

ALIGNMENT DATA:

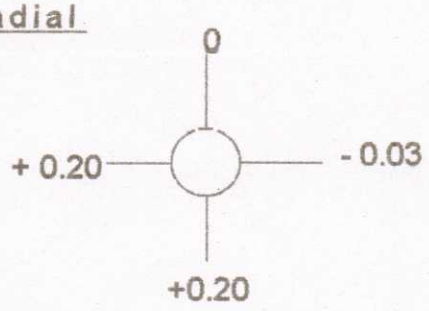
Gear Box to HP Compressor:

Before Preventive Maintenance:

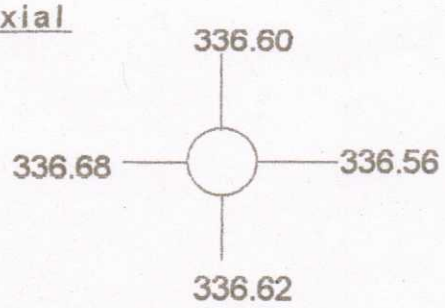
Dial on HP Coupling:

All values are in mm.

Radial



Axial



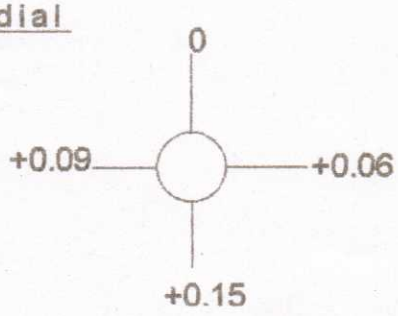
CODE NO	JOB DESCRIPTION

After Preventive Maintenance:

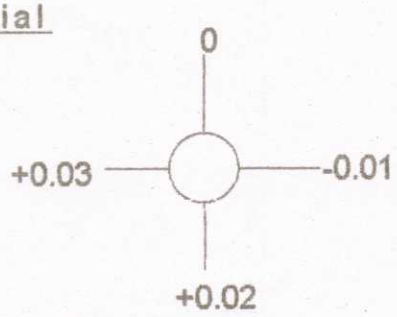
Dial on HP coupling:

All values are in mm.

Radial



Axial

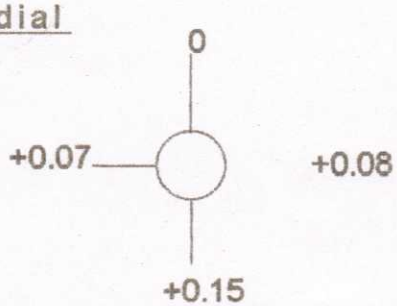


Designed value:

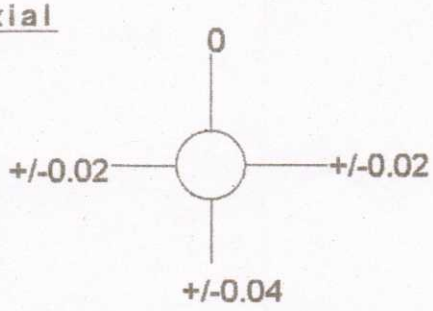
Dial on HP Coupling

All values are in mm.

Radial



Axial

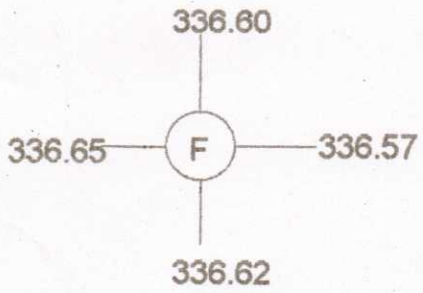


CODE NO JOB DESCRIPTION

Distance between the coupling flanges:

Design - 336.04 to 336.54 mm

Actual -



CLEARANCE DATA :

All the values are in mm

SR. NO.	Description	Design Value	Actual value BPM	Actual value APM
1	Thrust bearing clearance	0.25 -0.35	0.31	0.31
2	Bearing clearance coupling end	0.11~ 0.14	0.16	0.14
3	Bearing clearance free end	0.11~ 0.14	0.13	0.11

(B) PREVENTIVE MAINTENANCE OF HITACHI COMPRESSOR K-1801 L.P.CASE :

a) Both sides couplings were decoupled and alignment checked.
b) Bearing clearances were checked, bearing pads were cleaned and refixed.
c) Both sides alignment were carried out and coupled.

CLEARANCE DATA :

All the values are in mm

SR. NO.	Description	Design Value	Actual value BPM	Actual value APM
1	Turbine end radial bearing clearance	0.11-0.15	0.15	0.15
2	Gear box end radial bearing clearance	0.11-0.15	0.14	0.14

CODE NO JOB DESCRIPTION

(C) PREVENTIVE MAINTENANCE OF GEAR BOX M-1801 :

Following preventive maintenance jobs were carried out.

- Top cover of the gear box was removed.
- Bearing halves were removed, cleaned and clearances checked.
- Low speed shaft bearings were polished using green rouge and assembled back.
- High speed shaft bearings were removed, cleaned and checked for clearances.
- Clearances were high and rubbing marks were observed.
- Replaced high speed shaft bearings of both ends.
- Top cover of the gear box was boxed up.
- All pipe lines were connected after air flushing with new gaskets.
- Gear box and HP compressor were aligned.
- Coupling spacer was fixed and coupling guard boxed up.

CLEARANCE DATA:

All the values are in mm

Sr. No.	Description	Design Value	Actual value BPM	Actual value APM
1	LS shaft bearing clearance (LP Side)	0.14-0.38	0.10 / 0.18	0.15-0.21
2	LS Shaft bearing clearance(HP Side)	0.14-0.38	0.18-0.21	0.18-0.21
3	HS Shaft bearing clearance(LP Side)	0.13-0.36	0.20-0.55	0.13
4	HS Shaft bearing clearance(HP Side)	0.13-0.36	0.20-0.55	0.14

Thrust Bearing clearance : 0.26 - 0.38
Backlash : 0.4

OBSERVATION :

High speed shaft bearings of both ends found having scoring marks on both halves. Bottom half below the center line right side and top half above the center line on the left side when seen from LP Compressor side.

CODE NO JOB DESCRIPTION

(D) PREVENTIVE MAINTENANCE OF HITACHI COMPRESSOR DRIVE TURBINE Q - 1801 :

a) Both end radial bearing clearances were measured using micrometer
b) All the radial and thrust pads were polished by using green rouge and assembled.
c) All the linkages of the main regulating valve servomotor and the extraction valve servomotor were cleaned, eased and re-lubricated.

CLEARANCE DATA :

All the values are in mm

SR. NO.	Description	Design Value	Actual value BPM	Actual Value APM
1	Free end radial bearing clearance	0.188-0.307	0.19	0.22
2	Coupling end radial bearing	0.240-0.363	0.2	0.19
3	Thrust bearing	0.30-0.43	0.32	0.3
4	C/E oil seal clearance (Radial)- SR	0.085-0.285	0.2	0.2
5	F/E oil seal clearance (Radial) -SR	0.085 - 0.285	0.15	0.15

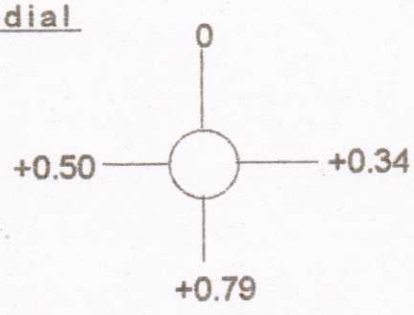
ALIGNMENT DATA:

L.P. Compressor to Turbine:

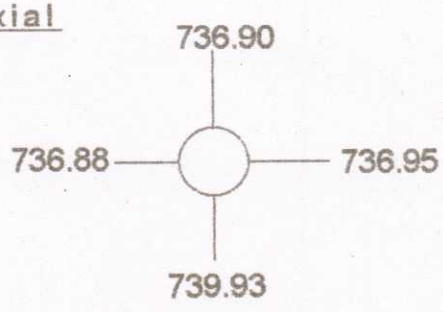
Before Preventive Maintenance:

Dial on Turbine Coupling:-
All the values are in mm.

Radial



Axial



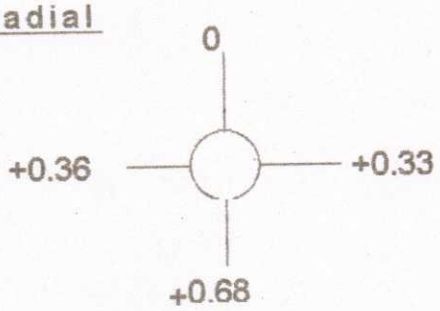
CODE NO JOB DESCRIPTION

After Preventive maintenance:

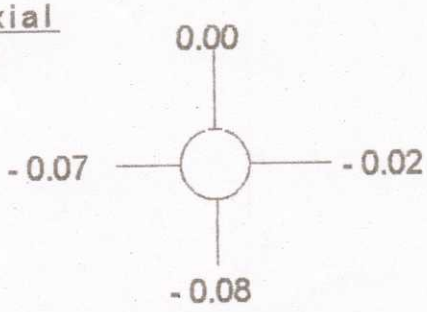
Dial on Turbine Coupling

All the values are in mm.

Radial



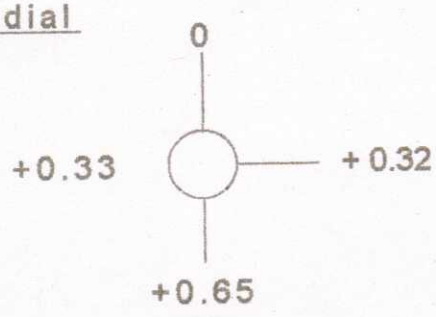
Axial



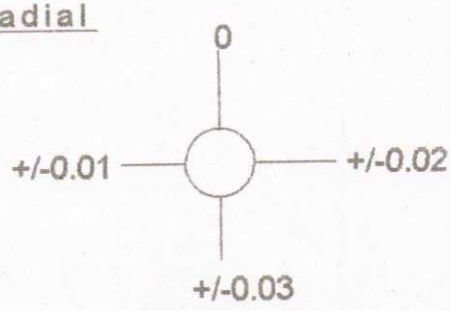
Original Value:

Dial on Turbine Coupling.

Radial



Radial



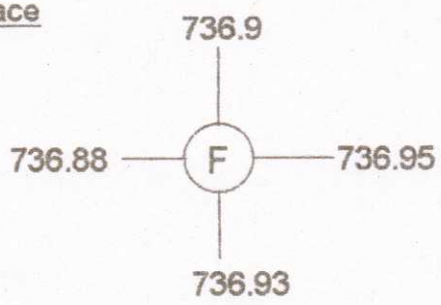
CODE NO JOB DESCRIPTION

Distance between the coupling Flanges

Design = 737.50 to 738.00 MM

Actual -

Face

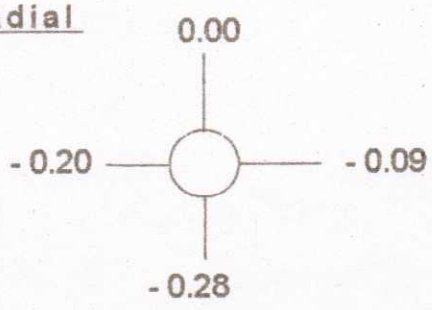


Gear Box to LP Compressor :

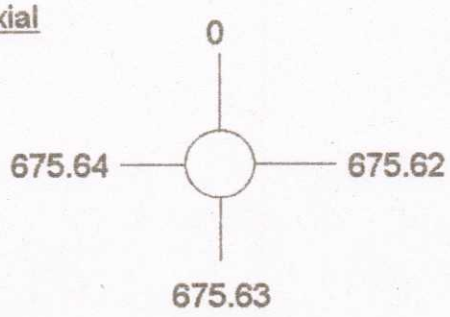
Before Preventive Maintenance

Dial on LP Compressor Coupling
All values are in mm.

Radial



Axial

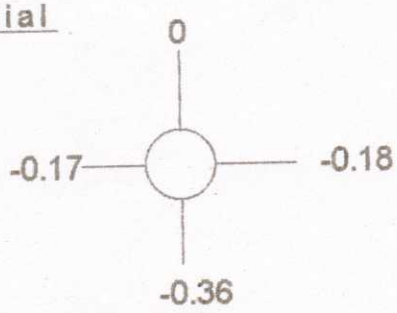


CODE NO JOB DESCRIPTION

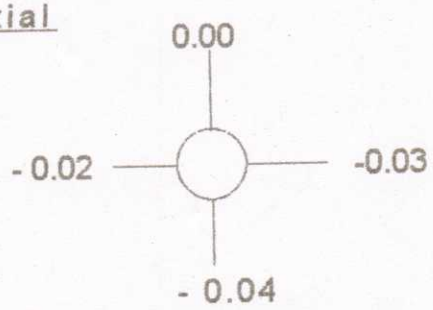
After Preventive maintenance :

Dial on LP Compressor Coupling

Radial



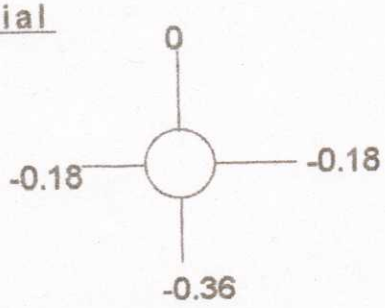
Axial



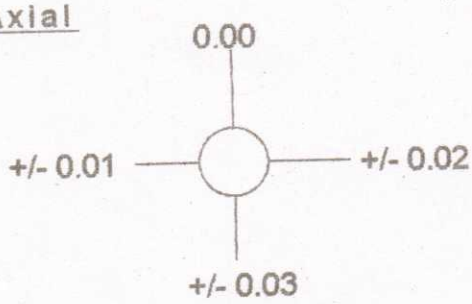
Original Value :

Dial on LP Compressor Coupling
All the values are mm.

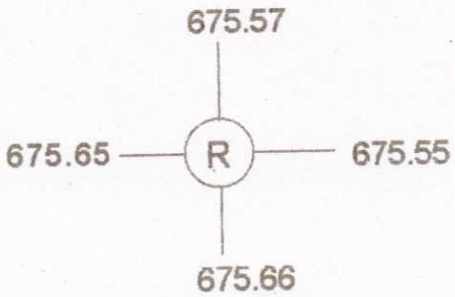
Radial



Axial



Distance between the coupling Flanges
Design = 675.50 to 676.00 MM
Actual-



CODE NO	JOB DESCRIPTION

a) After alignment all the coupling spacers were assembled after checking with the correct match marks.

b) All the covers were boxed up including guards etc.

c) All bearing covers were boxed up after cleaning them thoroughly and applying Hylomer blue compound to the split face.

02 02 01 LPCC CIRCULATION PUMP (P-1202 A/B) :

Following jobs were carried out :-

- Dismantled both pumps.
- Replaced casing of both pumps by new casings.
- Assembled pumps with new mechanical seal , gaskets and `O` rings.
- Installed the pumps in their positions.
- Checked level of the pumps.
- Aligned pumps with motors.

02 02 02 UREA MELT PUMP (P-1408) :

- Replaced complete pump by reconditioned spare pump.
- Opened jacketed suction line of pump and checked by carrying out hydrotest at 4kg/cm^2.
- 1st and 2nd segment of suction line from pump side were found bulged from inside.
- 2nd . Segment of suction line was replaced by new fabricated jacketed pipe.
- 1 st segment was repaired by welding .
- Hydrotest of other segments were carried out and a leak was detected from one weld joint of 3rd. Segment and the same was repaired by welding ,followed by DP test.
- Suction line boxed up.

02 03 01 PRILL TOWER I D FANS (K- 1401/ 1,2,3 & 4) :

Following jobs were carried out.

- Opened inspection cover.
- Cleaned fan blades
- Opened bearing covers ; cleaned & checked .
- Both bearings of K-1401/3 were replaced by new COOPER make split type roller bearing along with housing.
- Shaft and Labyrinth seal of K-1401/3 were replaced .
- Bearing covers boxed up with fresh grease.
- Alignment of fan with motor checked and rectified.
- Replaced Pedestal and both bearings along with labyrinth seal of K-1401/2

CODE NO	JOB DESCRIPTION

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

Following preventive maintenance jobs were carried out.

- Bearing of Inlet air fan (K-1701) opened, Cleaned and checked. Bearings found in good condition and boxed up.
- Bearing of K-1702 opened, Cleaned and checked, Bearings found in good condition and boxed up.
- Lube oil of bearings flushed.
- Fan pulley of Inlet air fan (K-1701) was replaced by new modified pulley of 935 mm dia.
- Guard of the fan (K-1701) modified to suit new pulley.
- Replaced perforated plate & gasket of fluidised bed cooler.

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

Following preventive maintenance jobs were carried out.

- Scrapper arm cleaned , damaged portion of scrapper arm repaired by welding and new aluminum sheet provided over scrapper arm.
- Gear Box checked.
- Oil of gear box flushed.
- Cement floor gap partition plates repaired and painted

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

Following preventive maintenance jobs were carried out.

- Bucket change over mechanism was cleaned thoroughly.
- Belt and pulley of the mechanism checked and found OK.
- Replaced bearings of Bucket shaft.
- Greasing of chain done.

CODE NO	JOB DESCRIPTION

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

Following heat exchangers were opened, Hydrojet cleaning done and boxed up with new gaskets.

(A) UREA PLANT :

1) Main L.O. Coolers of Hitachi Compressor Train (H-1814 A/B).
2) Surface condenser (H-1815)
3) Main L.O. Coolers of P.B. Compressor Train (H-1113 A/B).
4) Lube oil cooler (H-1123)
5) Flash tank condensor (H-1421)
6) 1 st evaporator (H-1422) with DM Water.
7) I st evaporator Condenser (H-1423).
8) II nd evaporator I st Condenser (H-1425).
9) II nd evaporator II nd Condenser (H-1426).
10) Final Condenser (H-1420).
11) Recirculation Heater (H-1204) with DM Water.
12) L.O. Coolers of P-1102 A/B/C.
13) L.O. Coolers of P-1201 A/B.
14) Pre evaporator Condenser (H-1419).
15) Desorber heat exchanger (H-1301 A/B/C)
16) Hydrolyser feed exchanger (H- 1351 A/B/C)
17) Reflux condenser (H-1352)
18) Vent condenser (H-1502)
19) CCS II Cooler (H-1207).
20) Plate type Heat Exchanger (H-1206) - Cleaning and servicing of heat exchanger was carried out by M/s Alfa Laval , Baroda. Replaced 129 nos. plates by reconditioned plates. These plates were reconditioned by M/s Alfa Laval , Pune at their works Mumbai.

(B) DRY ICE PLANT :

1) Inter stage coolers of Khosla Compressor (K-4705 A/B).

CODE NO	JOB DESCRIPTION

02 14 01 STEAM LEAK JOBS :

1. Steam / Condensate leak jobs were attended as per production list.

Material Consumed :

- Gate valve 1/2" x 800 # - 20 nos.
- Gate valve 3/4" x 800 # - 30 nos.
- Gate valve 4" x 150 # - 2 no.
- C.S. Pipe 1/2" NB - 30 mtr.
- C.S. Pipe 3/4" NB - 45 mtr.

02 17 01 VALVE REPAIR / INSPECTION / TESTING / REPLACEMENT :

The following Isolation valves were dismantled, Checked and Overhauled / replaced.

a) CO2 to II-1201 MOV - Replaced seat of the valve and boxed up.
b) P-1201 A :both discharge valve.- Replaced.
c) P-1201 B : both discharge valve - Replaced
d) P-1102 A :Discharge valves - Replaced both discharge I/V .
e) P-1102B :Suction I/V- Replaced II nd. I/V
f) P-1102C :recycle line I/V - Replaced 2nd. I/V of recycle line.
g) P-1102C :Discharge line I/V - Repaired 2nd. I/V .
h) PRCV-1504 I/V -Dismantled ,reconditioned and boxed up.
i) NH3 System FS bypass main I/V.--Dismantled ,reconditioned and boxed up.
j) CCS-I Butterfly valves- All the 3 valves were replaced by new one.
k) TICV -1101 bypass main I/V - Replaced .
l) PB Compressor (K-1101/2) - Replaced bonnet of 2nd. Discharge I/V.
m) CO2 to Stripper 2nd I/V -Dismantled ,reconditioned and boxed up
n) HICV1201 U/S I/V - Replaced complete valve.
o) MOV-1202 Carbamate to HPCC I/V .- Replaced complete valve.
p) Isolation valve(20 x 150#) of cooling water jump over line- Reconditioned by M/s. Dandy valves , Ahmedabad.

CODE NO JOB DESCRIPTION

02 17 02 **Rv'S OVERHAULING AND TESTING :**

Following Rv'S were removed, overhauled and tested at test bench by M/S.Flotech Engineering Services,Surat. against W.O. No.13/00428/KLL/9910619 and installed back in it's position.

Sr. No.	Tag No.	Equipment No and Name	Required Test Pr.		Actual Test Pr.		Remarks
			SET PR. (Kg/cm2)	RESET PR. (kg/cm2)	SET PR (Kg/cm2)	RESET PR. (kg/cm2)	
1	RV-1203	P-1201 A Suction RV	8.5	7.5	8.5	8	OK
2	RV-1204	P-1201 B Suction RV	8.5	7.5	8.5	8	OK
3	PSV-1201 C1	P-1201 C Suction RV	8.5	7.5	8.5	8	OK
4	RV-1102 /A	V-1103 Ammonia Suction Vessel	31	28	31	28	OK
5	RV-1102/B	V-1103 Ammonia Suction Vessel	31	28	31	28	OK
6	RV-1108-1	Liquid NH3 line from NH3 storage tank	31	28	31	28	OK
7	RV-1108-2	Liquid NH3 line from NH3 storage tank	31	28	31	28	OK
8	RV-1108-3	Liquid NH3 line from NH3 storage tank	31	28	31	28	OK
9	RV-1351	V-1351	24	23.5	24	21.6	OK
10	RV-1352	V-1352	6	5.4	6	5.4	OK
11	RV-1501	4 ata steam drum (V-1501)	7.5	6.5	7.5	6.8	OK
12	RV-1502	4 ata steam drum (V-1501)	7.5	6.5	7.5	6.8	OK
13	RV-1503	23 ata steam drum (V-1502)	25	22.5	25	22.5	OK
14	RV-1130	23 ata steam Header	25	22.5	25	22.5	OK
15	RV-1301	II nd Desorber (V-1301)	6	5.4	6	5.4	OK
16	RV-1202 /A	V-1202 to H-1205 line	6	5.4	6	5.4	OK
17	RV-1202 /B	V-1202 to H-1205 line	6	5.4	6	5.4	OK

CODE NO	JOB DESCRIPTION						
18	RV-1202 /C	V-1202 to H-1205 line	6	5.4	6	5.4	OK
19	RV-1205	P-1201 A Discharge RV	165	155	165	149	OK
20	RV-1206	P-1201 B Discharge RV	165	155	165	149	OK
21	PSV-1201/C2	P-1201 C Discharge RV	165	155	165	149	OK
22	RV-1504	V-1503 - 9 ata. steam header	12	11	12	11	OK
23	PSV-1901	2nd suction of Hitachi Compressor	7	6.3	7	6.3	OK
24	PSV-1902	3rd Suction of Hitachi Compressor	27	24.5	26.8	24.7	OK
25	PSV-1903	4th. Suction of Hitachi Compressor	110	99	110	100	OK
26	PSV-1181	Final disch. of Hitachi Compressor.	176	155	176	158	OK
27	RV-1201A	HP System	165	155	165	149	OK
28	RV-1201B	HP System	165	155	166	150	OK
29	RV-1201C	HP System	165	155	167	151	OK
30	RV-1110	Ammonia System	31	28	31	28	OK
31	RV-1106	Ammonia System	31	28	31	28	OK
32	RV-1102A	Ammonia System	31	38	31	28	OK
33	RV-1102B	Ammonia System	31	38	31	28	OK
34	RV-1107	Ammonia System	31	38	31	28	OK
35	RV-1209	RV of V-1203	10	9	10	9	OK
36	RV-1129A	4 ata steam header	6	5.4	6	5.4	OK
37	RV-1129B	4 ata steam header	6	5.4	6	5.4	OK
38		23 ata.exhaust line of PB compr.	27	24.3	27	24.3	OK
39	RV-1916	23 ata. Steam header of K-1801.	27	24.3	27	24.3	OK
40		4 ata steam header of K1801.	4	3.6	4	3.6	OK

CODE NO	JOB DESCRIPTION

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

The following Check valves were dismantled, Overhauled and fixed back in position.

a) Co2 to H-1201. - Reconditioned Seat and plug of the valve by machining
b) NH3 to H-1202. - Seat machined & boxed up.
c) NH3 to V-1201 - Seat machined and replaced Plug & Guide of the valve.
d) Carbamate to H-1202 - reconditioned Seat and plug of the valve by machining
e) Carbamate to H-1203 - Reconditioned Seat and plug of the valve by machining
f) 4 ata. steam to V-1352 - Reconditioned seat of valve by lapping.
g) 23 ata. steam to V-1351- Reconditioned seat of valve by lapping.
h) Extraction Steam NRV of Q-1801
i) P-1202 A discharge NRV - Replaced gasket and packing .

02 18 01 CLEANING /SERVICING OF LEVEL GAUGES :

Gauge glass of following vessels were replaced.

a) 4 ata steam drum (V-1501)
b) 9 ata steam drum (V-1503)
c) Rectifying column (V-1202)
d) L.P Condensor Separator (V-1205)
e) Ist Desorber (V-1352)
f) II Desorbe (V-1301)
g) Steam Condensate tank (T-1501)

02 19 01 HIGH PRESSURE VESSEL JOBS :

(A) AUTOCLAVE (V-1201) :

Top cover of Autoclave was opened for inspection and to carry out following jobs :-

a) Replacement of liners of Manway , top hemi end and first course.
b) Replacement of Insert liner of compartment no.10.
c) Replacement of Bulged liner of compartment no.11.

The above jobs were carried out through M/s.L&T,Mumbai against WO. NO. 13/00421/KLL / 1183PB/9911231 as per procedure mentioned hereunder:-

CODE NO JOB DESCRIPTION

(A) **Preparation** :

a) Opened alternate tray segments for the entry of manpower, electric cable ,telephone , air hose, vacuum blower hose etc.
b) Proper lighting , air and ladder arrangement were made inside the Autoclave .
c) Proper scaffolding arrangement made in 1st. and 11th. Compartment.

I) **Procedure for the replacement of liners of Man way , top hemi end first course and Insert liner of compartment no.10.**

i) Removed old liners and backing strip of first course , top dome (crown plates + petal plates) and manhole by grinding the welding seam without any damage to carbon steel shell.
ii) Removed insert liner of compartment no 10 by grinding the welding seam without any damage to loose liner /back-up strip/ carbon steel shell.
iii) Removed old weld material from shell liner by grinding.
iv) Visual inspection , MPI and thickness measurement of CS shell surface were carried out after proper cleaning.
v) Thickness of Buffer layer checked with Permascope.
vi) Pressurised air from nearby weep hole to ensure clear air passage.
vii) Prepared bevel edge on old shell liner by grinding without any damage to loose liner/ back-up strip.
viii) Fabricated new back-up strip for long seam as per attached sketch V1.
ix) Preheat the shell surface at min. 90 degrees and tack weld the backing strips with the C.S shell surface.
x) Installed new prefabricated liner in position and tack weld with back up strip providing required gap and dimensions as per attached sketch V2.
xi) Checked liner gap after fit-up.
xii) DPT of beveled edge carried out.
xiii) Root run completed by using filler wire Sandvik- 25.22.2 LMn by TIG welding keeping low heat input.
xiv) Visual and DPT after root run.
xv) Ferrite measurement after root run.
xvi) DPT of new liner surface on both side . Ferrite check of new liner.
xvii) Air and soap solution test at 0.2 kg/cm2.
xviii) Checked liner gap after root run.
xix) Fill up the remaining weld pass by using filler wire of 25-22-2 LMn by TIG - welding.
xx) Visual and DPT after final weld.
xxi) Ferrite measurement after final weld.
xxii) Cleaned and passivated the new weld by washing with 10% HNO3 and rinsed with plent of DM water.
xxiii) Autoclave boxed up with new Aluminium gasket.
xxiv) Hydrotest carried out at 150 kg/cm2 for ½ hrs.
xxv) Opened manhole cover.
xxvi) DP test of welds and gap measurement behind new liners carried out.
xxvii) Ammonia leak test of new welds carried out as per procedure.

CODE NO	JOB DESCRIPTION

II) **Procedure for the replacement of Bulged liner of compartment no.11.**

i) Removed tray at the location of bulge.
ii) Removed bulged liner 200 mm above and 100 mm below the circumferential weld along with backing strip .
iii) Visual inspection , MPI and thickness measurement of CS shell surface were carried out after proper cleaning.
iv) Fabricated one liner segment OD round 2660 mm and 286 mm height. Cut them into three sections for easy insertion and handling.
v) In the new liner slots were made by grinding as per attached sketch V3.
vi) Fabricated backing strips for new long and circumferential seam as per attached sketch V4.
vii) A filler strip of 2670mm ID X 29mm width X 5mm thk. was made to fill the existing circumferential groove present in CS shell. Cut this ring in 10 parts.
viii) Pressurised air from nearby weep hole to ensure clear air passage.
ix) Prepared bevel edge of old shell liner by grinding without any damage to loose liner/ back-up strip.
x) New filler strips fitted up into the groove . Between each filler strip a gap of 8mm was kept to allow proper leak detection.
xi) Preheat the shell surface at min. 90 degrees and tack weld the backing strips with the C.S shell surface using 25-22-2LMn filler wire.
xii) Hammer the trapezoid-backing strip underneath the existing liner and between the liner segments as shown in sketch V5.
xiii) Installed new prefabricated liner in position and tack weld the liner to stainless steel filler and backing strip providing required gap and dimensions as per sketch V6.
xiv) Checked liner gap after fit-up.
xv) DPT of beveled edge carried out.
xvi) Root run completed by using filler wire Sandvik- 25.22.2 LMn by TIG welding keeping low heat input.
xvii) Visual and DPT after root run.
xviii) Ferrite measurement after root run
xix) DPT of new liner surface on both side . Ferrite check of new liner.
xx) Air and soap solution test at 0.2 kg/cm2.
xxi) Checked liner gap after root run.
xxii) Fill up the remaining weld pass by using filler wire of 25-22-2 LMn by TIG welding.
xxiii) Visual and DPT after final weld.
xxiv) Ferrite measurement after final weld.
xxv) Cleaned and passivated new weld by washing with 10% HNO3 and rinsed with plenty of DM water.
xxvi) Autoclave was boxed up with new Aluminium gasket.
xxvii) Hydrotest carried out at 150 kg/cm2 for
xxviii) Opened manhole cover .
xxix) DP test of welds (Lower cirseam only) and gap measurement behind new liner carried out.

CODE NO JOB DESCRIPTION

OTHER INFORMATION PERTAINING TO NEW LINER :

i) MOC of new liners : Sandvik SS2RE69.
ii) MOC of backing strip :-

a) For Manway , Dished end and First course(25 mm X 3 mm thk) : SS316L
b) For existing shell groove(25mm X 5 mm thk) : Sandvik SS2RE69
c) For bulged liner (25 mm X 3 mm thk) :Sandvik SS2RE69

iii) Welding filler wire : Sandvik 25.22.2LMn. (2.4 mm dia X 1000 mm Long)
iv) No. of liner segment :-

a) Manway : 01
b) Dished end : 12 petals
c) First course : 3
d) Insert liner : 3
e) Bulged liner :3

III.) OTHER REPAIR JOBS CARRIED OUT INSIDE AUTOCLAVE :

Compartment no 4 :

3 nos. Undercut each having 3" length in cirseam were repaired by grinding and welding by using 25-22-2 L Mn filler wire . DP check of repaired weld was carried out and found to be OK.

Compartment no 5 :

2 nos. Undercut repaired by grinding and welding by using 25-22-2 L Mn filler wire . DP check of repaired weld was carried out and found to be OK.

Compartment no 7 :

5 nos. Undercut were repaired by grinding and welding by using 25-22-2 L Mn filler wire . DP check of repaired weld was carried out and found to be OK.

Compartment no.8 :

One no. Pinhole was repaired by grinding and welding by using 25-22-2 L Mn filler wire . DP check of repaired weld was carried out and found to be OK.

Compartment No.12 (Bottom Dished end.) :

3 nos. Pinholes and 5 nos. Undercut were repaired by grinding and welding by using 25-22-2 L Mn filler wire . DP check of repaired weld was carried out and found to be OK.

CODE NO	JOB DESCRIPTION

After completion of above repair jobs top cover of Autoclave (V-1201) boxed up with new Kempchen gasket.

(B) **H P STRIPPER (H-1201) :**

Erection of new HP stripper manufactured by M/s L&T , Mumbai was carried out by Technical department.

(C) **II P Carbamate Condenser (II-1202) :**

Top and bottom cover of HPCC were opened and handed over to Inspection department for inspection. Top and bottom covers boxed up with new gaskets after completion of inspection and minor repair jobs.

02 19 02 **LOW PRESSURE VESSEL JOBS :**

(A) **CO2 SPRAY COOLER (H-1104) :**

Manhole cover of CO_2 spray cooler was opened for inspection of the cooler. Following observation were made and repair jobs carried out.

- Demister pad was found OK.
- In view of through leakage at two locations due to corrosion , it was decided to provide SS liner inside the spray cooler up to approx.2.8 mtr. from bottom. At other leakage area new plate was provided flush with the shell.
- Bottom trays found intact in position.
- Epoxy paint coating peeled off. Repainting of cooler was done.
- Manhole cover of the cooler was boxed up with new gasket.

(B) **CO_2 KNOCKOUT DRUM (V-1101) :**

Manhole cover of CO_2 Knockout drum was opened for inspection. Following observation were made and minor repair jobs carried out.

- Overall condition of CO_2 knockout drum found satisfactory.
- Loose fasteners were tightened and 2 nos. new fasteners were provided in place of missing fasteners of demister pad supporting ring.
- Epoxy paint coating peeled off at some location and epoxy paint applied in these locations.
- Manhole cover boxed up with new gasket.

CODE NO JOB DESCRIPTION

(C) AMMONIA SUCTION FILTER (V-1102) :

Cover of Ammonia suction filter was opened for inspection. Visual inspection was carried out and overall condition of Ammonia suction filter found to be OK. Damaged wire mesh of the filter was repaired. Overall condition of the suction filter was found to be satisfactory. Ammonia suction filter boxed up with new gasket.

(D) AMMONIA SUCTION VESSEL (V-1103) :

Cover of Ammonia suction vessel was opened for inspection. Visual inspection was carried out. Following observation were made and repair jobs carried out :-

i) One pin hole of approx. 2mm dia X 5mm depth was observed on the welding of $1^1/_2$" line for lower level troll located on south west segment of the shell . Repaired pin hole by grinding & welding.
ii) Oil layer observed on shell and bottom end.
iii) Vessel was cleaned properly and boxed up with new gasket.

(E) RECTIFYING COLUMN (V-1202) :

Top cover, Manhole cover and handhole of the rectifying column were opened. Rasching ring removed from the column and cleaned properly. Visual inspection of rectifying column was carried out. Perforated grating was found intact in position . Top and bottom compartments were cleaned properly. Rasching rings were put back in position. Top cover, Manhole cover and handhole covers were boxed up with new gasket.

(F) L.P. ABSORBER (V-1203) :

Top cover and Manhole cover of L.P. Absorber were opened for inspection. Visual inspection and DPT at certain locations were carried out. Following observation were made and repair jobs carried out :-

i) A corrosion cavity of approx. 1mm depth was observed in seal welding of 3" NB gas inlet nozzle with shell at east side. Cavity was repaired by grinding & welding.
ii) One no. Pin hole of approx. 10 mm depth was observed in seal weld joint of manhole to shell . Repaired pin hole by welding and grinding . DP test and Soap solution test at $0.5Kg/Cm^2$ of repaired weld were carried out.
iii) One no. Clamping bolt of sieve tray was provided in place of missing bolt.
iv) Manhole cover boxed up with new gasket.

CODE NO	JOB DESCRIPTION

(G) L.P. VENT SCRUBBER (V-1206) :

Opened Manhole cover of L.P. Vent Scrubber for inspection. Inspection of the vessel was carried out. Condition of demister pad was found to be satisfactory. All fasteners were found intact. One no. Pin hole was found in weld joint of reinforcement pad of manhole to shell from outside. Pinhole was repaired by grinding /welding . Manhole cover boxed up with new gasket.

(II) AMMONIA SCRUBBER (V-1207) :

Top cover, top and bottom handhole covers were opened. Rasching ring removed and vessel was handed over for inspection. Visual inspection was carried out. One no. flange bolt of NH3 water spray nozzle was found loose and the same was tightened. Two nos. Corrosion cavities of approx. 2 mm. depth were observed in 3"NB centre nozzle of manhole and the same were repaired by grinding and welding followed by DP test. Rasching ring put back in position. Top cover and hand hole covers were boxed up with new gasket.

(J) II DESORBER (V-1301) :

Top and bottom manhole covers were opened for inspection. Visual inspection was carried out. Condition of II nd desorber found satisfactory. Loose clamping fasteners of trays were tightened . Top and bottom manhole covers were boxed up with new gaskets.

(K) HYDROLYSER (V-1351) :

Top and bottom manhole covers of hydrolyser were opened. Following observation were made and repair jobs carried out :-

Bottom Manhole :-

- Brownish colouration was observed inside the vessel.
- New fasteners were provided in place of missing one and loose fasteners were tightened.

- **Top Manhole :-**

- Brownish colouration was observed inside the vessel.
- New fasteners were provided in place of missing one and loose fasteners were tightened.
- Condition of the found to be satisfactory.

Top and bottom manhole covers were boxed up with new gaskets.

CODE NO JOB DESCRIPTION

(K) I' ST. DESORBER (V-1352) :

Top and bottom manhole covers of Ist desorber were opened for inspection. Visual inspection was carried out.All fasteners were found intact. Stitch welding of tray with the vertical plate found to be broken near manhole and the same was repaired by welding.

Top and bottom manhole covers were boxed up with new gaskets.

(L) FLASH TANK SCRUBBER (V-1421) :

Manhole cover of Flash Tank Scrubber was opened for inspection. Following observation were made and repair jobs carried out :-

i) Brownish colouration was observed inside the vessel.
ii) Supporting ring welding of demister pad was found corroded at few locations.
iii) Carbamate leakage sign were observed from tell tale holes of saddle support reinforcement pads at two location.
iv) Carbamate leakage sign were also observed from weld joint of saddle support to shell . DPT was carried out in these locations.
v) A crack was observed in weld joint on south side . However, a pinhole was detected on south side. These defects were repaired by grinding and welding followed by DPT.
vi) Manhole cover boxed up with new gasket.

(M) I EVAPORATOR SCRUBBER (V-1423) :

Manhole cover of I st evaporator scrubber was opened for inspection. Visual inspection was carried out. New fasteners provided in place of missing fasteners and loose fasteners were tightened. Damaged portion of supporting strip of demister pad was repaired. Manhole cover boxed up with new gaskets.

(N) 4 ATA STEAM DRUM (V-1501) :

Manhole cover of 4 ata steam drum were opened for inspection. Visual inspection was carried out. All loose bolts of baffle plates were tightened . New bolts & nuts were provided in place of missing bolts of baffle plates . Demister pads found intact in position. Hydrotest of steam drum carried out in presence of IBR inspector at 11.0 kg / cm^2 (g) on 04.04.2002.

(O) 23 ATA STEAM SATURATOR (V-1502) :

Manhole covers were opened for inspection. Visual inspection was carried out. Overall Condition of 23 ata steam saturator was found satisfactory. Manhole covers were boxed up with new gaskets.

CODE NO JOB DESCRIPTION

(P) 9 ATA STEAM SATURATOR (V-1503) :

Manhole cover was opened for inspection. Vessel was cleaned properly. Visual inspection was carried out. Overall Condition of 9 ata steam saturator was found satisfactory. Manhole cover boxed up with new gaskets.

(Q) II EVAPORATOR SEPARATOR (H-1424) :

Manhole cover of II evaporator separator was opened for inspection. Visual inspection was carried out. Overall Condition of equipment was found satisfactory. Manhole cover boxed up with new gaskets.

(R) UREA SOLUTION TANK (T-1401 / T-1401 A) :

Manhole cover of urea solution tanks were opened for inspection. Visual inspection was carried out. Bulging of bottom plate of tank T-1401 was observed at several locations in upward direction. Overall condition of the tanks were found satisfactory. Manhole cover boxed up with new gasket.

(S) AMMONIA WATER TANK (T-1301 / T-1301 A) :

Manhole cover of ammonia water tanks were opened for inspection. Visual inspection was carried out. Following observation were made and repair jobs carried out :-

i) Bottom plate of tank T-1301 found bulged at various locations , the same was also observed in past.
ii) Seal weld joint of 3" NB tank drain nozzle with tank shell was repaired by welding
iii) Severe bead depression , lumps, slag etc. were observed in seal weld joint of 4" NB nozzle for p-1426 suction with tank shell. These defects were rectified by grinding and welding.

Manhole cover boxed up with new gasket.

(T) FIRST STAGE SEPARATOR (V-1811) :

Manhole cover of separator was opened for inspection. Visual inspection was carried out. Overall condition of separator found to be satisfactory . Manhole cover boxed up with new gasket.

CODE NO	JOB DESCRIPTION

(U) **SECOND STAGE SEPARATOR (V-1812) :**

Manhole cover of separator was opened for inspection. Visual inspection was carried out. Overall condition of separator found to be satisfactory . Manhole cover boxed up with new gasket.

(V) **THIRD STAGE SEPARATOR (V-1813) :**

Manhole cover of separator was opened for inspection. Visual inspection was carried out. Over all condition of the separator was found satisfactory. Manhole cover boxed up with new gasket.

CODE NO JOB DESCRIPTION

02 20 01 **FABRICATION JOBS :**

i) Replaced 2 nos. CS elbow (3" X 90 degree X Sch. 80) in line no. MA-1604 - 3" , P-1102C discharge line due to 36% reduction in thickness.
ii) Outside corroded area of discharge line of P-1102 A near support was repaired by welding and grinding.
iii) Replaced one no. CS elbow (3" X Sch40) of outlet line of condensate pot of H-1422.
iv) Weldolet joint of TR-1204 in in line from Rectifying column (V-1202) to flash tank(V-1406) was repaired due to severe root concavity observed in radiography.
v) Following lines of GHH compressor were isolated from main Header.

Sr.No.	Line No. / Service	Line Size	Location
1	Cooling water	200NB	Near P.B Compressor return main I/V. On main CW header.
2	60 ata. steam	200NB	60 ata to GHH line above main header on pipe rack near CW jump over.
3	40 ata steam	50NB	40 ata to GHH main I/V on pipe rack near CW jump over valve.
4	4 ata steam	150NB	4 ata to GHH main I/V on pipe rack near CW jump over valve.
5	Cooling water Service	200NB	Cooling water inlet line to GHH near CW jump over valve on pipe rack.
6	23 ata steam	300NB	23 ata to GHH on pipe rack above cooling water jump over valve.
7	CO2	250NB	Suction line of GHH compressor near PB vent I/V.
8	CO2	150NB	D/S of 2nd I/V of PB compressor discharge line near H-1114.
9	CO2	150NB	HICV-1022 d/s flange to vent header near V-112 separator.
10	Inst. air	40NB	Instrument air to GHH on pipe rack above K-1102/A air blower.
11	Plant air	25NB	Plant air to GIII I on pipe rack above point no.1.
12	Raw water	25NB	Raw water to GHH compressor main I/V on pipe rack near CW jump over.
13	Cooling water	200NB	Cw inlet to GHH compressor on pipe rack near CW jump over.

CODE NO	JOB DESCRIPTION

i. Replaced isolation valve of carbamate to HPCC line.
ii. Replaced valve body of HICV-1201 U/S I/V (4" BEL valve)
iii. Suction line of P-1305A/B was connected to suction line of P-1200.
iv. New line for anticorrosion air was fabricated and tapping was taken .

v. Lube oil pump of P-1201C was relocated.
vi. Provided water and air hose station on K-1801 floor.
vii. Replaced discharge 'T' of P-1201B.
viii. Provided NRV on DM water inlet line to P-1102C.
ix. Replaced top & bottom I/V of gauge glass of 4 ata steam drum.
x. Provided 23 ata injection to common discharge line of P-1204 A/B.
xi. Relocated drain line of V-1502.
xii. Replaced steam coil of V-1205 and repairing of shell cracks done.
xiii. Drain line of V-1503 was extended with I/V.
xiv. Replaced flanges of HICV-1208 line.

02 21 01 **BELT CONVEYORS :**

(A) **PRILL TOWER CONVEYOR SYSTEM (M-1403) :**

Following jobs were carried out.

- Belt joints were checked and found to be ok.
- New skirt board sealing system of M/s Kaveri Ultra Polymers, Mumbai was installed.
- Damaged rollers were replaced.
- Alignment of motor to gearbox and gearbox to pulley were checked/rectified.

(B) **LINK CONVEYOR SYSTEM (M-1419) :**

Following jobs were carried out.

- Replaced belt .
- New skirt board sealing system M/s Kaveri Ultra Polymers, Mumbai was installed
- Damaged rollers were replaced.
- Alignment checked/rectified. Greasing of chain done.
- Gear box checked and oil of gear box flushed.

CODE NO	JOB DESCRIPTION

(C) NEW LINK CONVEYOR SYSTEM (M-1421) :

Following jobs were carried out.

- Belt joints were checked and found to be ok.
- New skirt board sealing system M/s Kaveri Ultra Polymers, Mumbai was installed
- Damaged rollers were replaced.
- Greasing of bearings were done
- Gear box checked and oil of gear box flushed.
- Alignment of motor to gear box checked/rectified.

PLANT TURNAROUND - MARCH - APRIL - 2002

UREA PLANT

INSPECTION JOBS

CODE NO	JOB DESCRIPTION

02 41 01 INSPECTION JOBS :

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

1. Replacement of H.P.Stripper H-1201 with modified pipings was carried out. Inspection of the weld joints was carried out by DP test followed by radiography.

2. Liner replacement of Autoclave V-1201 was carried out for top dished end, manway, top piece of cylindrical liner at top compartment, insert liner at 10th compartment and replacement of bulged liner at 11th compartment. Various inspection activities were carried out as per the check plan attached at **annexure** A. This job was carried out by M/S L & T. Ammonia leak test was performed after hydrotest.

3. Internal inspection and ultrasonic thickness measurement of other vessels in the Plant.

4. Ultrasonic thickness measurement of various pipelines including HP lines in the Plant.

5. Dye penetrant examination and radiography of weld joints of the following pipe lines where some of the fittings were replaced. viz;

   a. Discharge line of Ammonia pump P 1102 C (MA-1604-3"- 2 nos. elbow)
   b. Discharge line of Carbamate pump P 1201 A/B
   c. 23 Ata steam line to GHH compressor.
   d. IIICV 1202 upstream line.
   e. Discharge line of P.B. Compressor.
   f. 60 ata BFW line on pipe rack which had developed sag.
   g. Outlet line of V-1401 (One no. Elbow- 3" sch 40)

HIGH PRESSURE VESSELS :

The detailed observations and recommendations for corrective actions required on 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.

CODE NO JOB DESCRIPTION

(1) AUTOCLAVE (V-1201) :

(A) VISUAL INSPECTION :

Thorough visual inspection of the liner and its welds, trays and internals was carried out. Observations made on each compartments are mentioned below. Repairing on marked locations was carried out and inspected by D.P. test followed by ferrite content checking.

01) TOP COVER :

The overlay welding was covered with a blue oxide layer of about 1 mm. The blind pipe of nozzle R3 showed some condensation corrosion inside and around the weld to cover. Pipe liner thickness reduced locally from 6 to 2.5 mm. Repair may be neeessary in the near future. Seal welding of one plug of blind flange of nozzle was grinded and rewelded.

02) COMPARTMENT NO.1 (TOP COMPARTMENT) :

Liner of the manway, dome and liner below top dome were replaced by new one as a part of improved reliability as reduction in thickness was observed during past inspection. The liner segments were fabricated from 7 mm thick plate of 2RE69 material so as to get a minimum thickness of 6 mm or more after fabrication. The inspection activities were carried out as per the check plan attached at Annexure-A. The records of the gap measurements are attached at Annexure-A1.

03) COMPARTMENT NO.2 :

Found satisfactory.

04) COMPARTMENT NO.3 :

Insert liner plate which was replaced during previous shutdown had shown almost no corrosion attack. Just above the circumferential weld , liner was found bulged outward (concave) by amount of approx. less than 5 mm in circumferential length of approx. one mtr. and width of 6" at the north-east side. DP test on the bulged liner was carried out , no service defects were observed.

05) COMPARTMENT NO.4 :

Insert liner plate which was replaced during previous shutdown had shown almost no corrosion attack .Just above the circumferential weld , liner was found bulged outward by amount of approx. less than 5 mm in circumferential length of approx. two mtr. and width of 6" at the west side.

CODE NO JOB DESCRIPTION

Approx. 30 cm below circumferential weld seam a concave bulging of approx.100mm dia and 3 mm depth was observed at west side. DP test on the bulged liner was carried out , no service defects were observed. Undercuts were observed at three locations which were marked for repairs. Two nos. Of undercuts were marked for repair.

06) COMPARTMENT NO.5 :

Convex bulging of liner plate was observed just above the circumferential weld joint by approx. 4 to 7 mm height in approx. 60 % of the circumferntial length from north to south direction. DP test on the bulged liner was carried out , no service defects were observed.

07) COMPARTMENT NO.6:

Convex bulging of liner plate was observed above the circumferential weld joint by approx. 7 to 10 mm height in approx. 50 % circumference at the west side.Concave bulging having a depth of less than 5 mm was observed at approx. One meter below circumferential weld in an area of approx. 750 x 100 mm at the east side of shell liner. DP test on the bulged liner was carried out , no service defects were observed.

08) COMPARTMENT NO.7 :

Convex bulging of liner plate was observed above the circumferential weld joint by approx. less than 5 mm height in approx. 2 mtr. circumference at the west side. Five nos. of undercuts were marked for repair. DP test on the bulged liner was carried out , no service defects were observed.

09) COMPARTMENT NO.8 :

Convex bulging of liner plate was observed at approx. 30 cm above the 8 th tray having a height of less than 4 mm in approx. 2.5 mtr circumferential length and 150 mm width at the east side. DP test on the bulged liner was carried out , defect was observed on long. Weld seam which was marked for repair.

10) COMPARTMENT NO.9 :

Found satisfactory.

CODE NO JOB DESCRIPTION

11) COMPARTMENT NO.10 :

Insert liner plate was replaced by new one as the old insert liner had shown high corrosion and weld undercuts. Min. thickness of old insert liner was found to be 3.8 mm. The inspection activities for the replacement of the liner were carried out as per the check plan attached at Annexure-B. The records of the gap measurements are attached at Annexure-B1.

12) COMPARTMENT NO.11 :

Severe Convex bulging of liner just above the circumferential weld seam was observed on complete circumference by approx. 15 mm height. Replacement of this bulged liner was carried out. The inspection activities were carried out as per the check plan attached at Annexure-C. The records of the gap measurements are attached at Annexure-C1.

Just below circumferential seam concave bulging of liner in approx. 6" dia. area and about 8 mm max. depth was observed at three locations. All U-clits were replaced in this compartment.

11) COMPARTMENT NO.12 (BOTTOM COMPARTMENT.) :

Weld joints of all nozzles , petal plates and crown plates of bottom dished end liner as well as patch plates were DP tested. Defect indications observed were marked for repair.

(B) LINER THICKNESS MEASUREMENT :

Ultrasonic thickness measurement was carried out on liner . The readings are summarised as below:

CODE NO JOB DESCRIPTION

(1) LINER THICKNESS :

Description	Min.Thk. (mm)	Max.Thk (mm)	Remarks
Man way			Replaced with 2 RE69, min.thk. 6.5
Dome area			Replaced with 2 RE69, min.thk. 6.5
Compartment 1 Top course			Replaced with 2 RE69, min.thk. 6.5 mm
	Min.Thk.	Max.Thk	Remarks
Compartment 2	4.3	4.9	
Compartment 3	4.3	4.6	
Compartment 4	4.4	4.7	
Compartment 5	4.8	5.3	
Compartment 6	4.7	5.1	
Compartment 7	4.8	4.9	
Compartment 8	4.7	4.9	
Compartment 9	4.8	4.9	
Compartment 10	5.0	5.5	
Compartment 11 old liner	4.6	4.6	
Compartment 11 new (Partial)			Replaced with 2 RE69, min.thk. 6.7 mm
Compartment 12 Shell liner	4.7	4.7	Installed thickness 5 mm
Compartment 12 Dome liner	6.3	6.7	Fabricated from 7 mm thick 2RE69 plate.

(2) INSERT LINER :

a) Min. thickness of 6.1mm, 6.2mm, 6.4mm and 6.6mm was observed for compartment no. 3,4 ,8 and 9 respectively.

b) Min. thickness of new insert liner was observed 6.7 mm for compartment no.10 which is replaced during this shutdown.

CODE NO JOB DESCRIPTION

(3) DOWN COMER AND TRAYS :

Compartment No.	Downcomer thickness mm		Tray thickness mm	
	Min.	Max.	Min.	Max.
1				
2	9.9	10.7	7.5	8.1
3	9.8	11	7.6	8.5
4	9.8	10	7.6	8
5	9.7	10.4	7.4	8.3
6	9.9	10.2	7.6	8.1
7	10.1	10.5	7.7	8
8	9.9	10.3	7.8	8.2
9	10.1	10.3	7.9	8.5
10	10.1	10.4	8.1	8.6
11	10.3	10.4	8.4	8.5
12	10.3	10.3		

(C) SHELL THICKNESS :

Thickness measurement of shell was carried out for top compartment from inside after removal of liner at the time of liner replacement. The readings are as under.

Description	Design Thk. mm	Min.Thk. mm	Max.Thk. mm
Shell	107	109.1	111.5
Manway	75	74.5	74.6
Dome (shell side)	55	57.8	59.2
Dome (Manway side)	107 (Thk.reduced to match dome end for welding with shell)	93.3	97.2

(2) IIP STRIPPER (II-1201) :

New HP Stripper,supplied by M/s L&T was installed by M/s Petron.Two nos. of cranes were tested at site for erection of the same.All new welded joints were DP tested. Wherever radiography of the joints was called for,the same were radiographed.

CODE NO JOB DESCRIPTION

(3) H.P. CONDENSER H-1202:

The following inspection activities were performed.

(a) Visual Inspection
(b) Thickness measurement

The observations on above inspections are as under. :

(A) VISUAL INSPECTION :

Top Cover & Bottom Cover : Sealing face was found satisfactory. Liner & welds were found smooth.

Top Channel : The J-bolts showed some crevice corrosion on the screw thread. The sealing face was satisfactory. The overlay weld of tube sheet had shown some minor pitting. Tube to tube sheet welds were smooth.

Bottom Channel : The sealing face was satisfactory. Weld joints of Gas inlet nozzle, which was repaired during last shutdown due to heavy corrosion of one of the two weld seams was found satisfactory. Tube to tube sheet weld and tube sheet overlay weld was found smooth. Three nos. of pin holes were observed on manway liner. The same were repaired by grinding and welding.

(B) OVERLAY WELD AND LINER THICKNESS MEASUREMENT :

Top Section :

Description	Minimum Thickness, mm	Maximum Thickness, mm
Cover (Overlay)	19.2	19.8
Man way (Liner)	5.5	7.7
Dome area (Liner)	6.5	6.9
Cylindrical area (Liner)	6.3	6.8
Tube sheet-Overlay weld	11.11	16.14

Bottom Section :

Description	Minimum Thickness, mm	Maximum Thickness, mm
Cover (Overlay)	18.7	19.7
Man way (Liner)	4.5	7.2
Dome area (Liner)	6.4	6.9
Cylindrical area (Liner)	6.2	6.9
Tube sheet-Overlay weld	11.5	16.7

CODE NO JOB DESCRIPTION

02 41 02 HIGH PRESSURE PIPING INSPECTION :

(A) RADIOGRAPHIC INSPECTION :

Radiography of butt weld joints of the weldolet of following H.P. Line tappings was carried out.

Sr. No.	Fitting Identification	Line Where Installed	Observation	Remark
1	TR-1210	Stripper liquid outlet line	Corrosion observed	To be replaced during next shutdown
2	HPF to Seal isolation valve	Liquid outlet from V-1201	Weld corrosion detected	To be replaced during next shutdown
3	HPF to carbamate line to HPCC	Carbamate pump discharge line to HPCC	Initiation of corrosion detected	Replaced
4	HPF to Ammonia line to HPCC	Ammonia pump discharge line to HPCC	Mild corrosion seen	Replacement recommended within one/two years
5	TR-1204	Rectifying column liquid outlet	Weld corrosion	Replaced
6	TR-1208	Rectifying column offgas line	Found satisfactory	-------
7	TI-1211	Liquid inlet to rectifying column	Found satisfactory	-------
8	PR-1213- 1"/2"	Autoclave unloading line	Found satisfactory	-------

02 41 03 OTHER VESSELS :

(1) H-1104 (CO2 SPRAY COOLER) :

TOP COMPARTMENT:

a) Demister pad was found intact in position.

b) Top layer of epoxy paint was peeled off at various locations.

c) However, paint layer below the top layer was found satisfactory.

d) Bottom trays were found intact in position.

e) Epoxy painting from the inside of complete vessel was recommended.

f) Thickness measurement was carried out. Refer Annexure-D

CODE NO JOB DESCRIPTION

BOTTOM COMPARTMENT:

Severe corrosion channeling were observed at scattered locations on the shell. The shell was lined with SS-304 plates to prevent further corrosion.

(2) **H-1113 A/B (Main L.O.Cooler for K-1101/1) :**

a) Pittings/Cavities of up to 2-3 mm depth were observed on bonnet & channel side.

b) Colling water lines were found to have thick scales..

(3) **H-1114 (Surface Condenser For K-1101/1) :**

a) Tube inside surface observed to have scaling and also some tubes found to have clogging with foreign debris.

b) Hydrojetting was recommended.

(4) **H-1123 (CRANK CASE COOLER OF K-1101/2) :**

a) Tube sheet observed to have considerable corrosion attack and also thinning of stub ends of tubes was detected.

b) Minor pitting corrosion was observed on channel cover .

(5) **H-1131 A (Crank case Cooler for P-1102/A) :**

a) Bonnet cap has got a hole of approx. 5 mm dia. And deep pitting. Replacement of the same was recommended.

b) Deep pitting of approx. 2-3 mm depth were observed on both the sides of tube sheet.

c) On east side of channel pitting up to 1-2 mm were observed.

d) Pitting up to 2 mm depth were observed on blind cover of channel side.

CODE NO JOB DESCRIPTION

(6) H-1131 B (Crank case Cooler for P-1 102/B):

(a) Both the tube sheets were found badly corroded.

(b) On east side channel pitting of approx. 3 to 5 mm depth were observed.

(c) west side bonnet and channel blind covers were found to have pitting of 2 to 3 mm depth.

(7) H-1204 (Recirculation Heater) :

a) Top tube sheet to tube seal welding found satisfactory.

b) Top and bottom channel covers were found in satisfactory condition with brownish colouration.

c) Orifice plugs inserted on bottom tubes were found tack welded with tube sheet. One no. Orifice plug found missing.

(8) H-1207 (CIRCULATION SYSTEM-II COOLER) :

a) Minor pittings/scaling were observed on the tube sheet area

(9) H-1231 A/B (L. O. COOLERS OF P - 1201 A/B) :

a) 0.5 to 1 mm deep pittings were observed on tube sheets,channel side and on bonnet.

b) Corrosion on cooler of P-1201 B was found more than that of P-1201 A.

(10) H-1301 A/B/C (Desorber heat exchanger) :

(a) Tube to tubesheet seal welding was found satisfactory for H-1301 A/B where as pinhloes were observed on tube seal welding of H-1301 C.

(11) H-1351 A/B/C (Hydrolyser feed pre heater) :

(a) Tube to tube sheet seal welding was found satisfactory.

CODE NO	JOB DESCRIPTION

(12) H-1352 (Reflux Condenser) :

a) Tube to tube sheet welding was found satisfactory.

b) Scales and corrosion pitting were observed on bottom channel cover. This was found predominant on outlet side.

c) One tube was found choked on outlet side.

d) Scaling were observed on the inside surface of the tubes and was found increasing gradually from cooling water inlet side to cooling water outlet side.

(13) H-1420 (Final Condenser of First Evaporator):

(a) Tubes to tube sheet seal welding was found satisfactory.

(b) Epoxy coating was found peeled off from the inside surface of bottom and top channel cover which had resulted in scattered minor corrosion. Epoxy coating was recommended.

(14) H-1422 (1 ST STAGE EVAPORATOR) :

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

a) The shell and Dish ends have assumed brownish coloration.

b) Intrnal surface of tubes were found to have minor scaling.

c) Lot of urea lumps along with water were found accumulated at the bottom dish end.

d) Other fittings like impingement cone and condensate distributors were observed to be satisfactory

(15) H-1424 (2 ND STAGE EVAPORATOR) :

Visual inspection of the equipment was carried out. The following observations were made.

a) Coloration of the shell was bright shiny.

b) Tube to tube sheet weld joints were found satisfactory.

c) All other weld joints were found satisfactory.

d) Lots of urea lumps along with water were found accumulated on the bottom dished end.

e) Impingment cone was found intact in position.

f) Thickness measurement was carried out. Refer **Annexure D**

CODE NO JOB DESCRIPTION

(16) H-1814-A (L.O. COOLER OF HITACHI COMPRESSOR) :

a) Tubes and tube sheet were found satisfactory.

b) Holes at the center of partition plates on east end were found choked.

c) Corrosion observed at the channel cover of east end.

(17) H-1814-B (L.O. COOLER OF HITACHI COMPRESSOR) :

a) Tubes and tube sheet were found satisfactory.

b) Holes at the center of partition plates on east end were found choked

c) Corrosion observed at the channel cover of east end.

(18) H-1815 (SURFACE CONDENSER FOR HITACHI COMPRESSOR) :

a) Scaling was observed at the inside surface of the tubes and clogging was also observed on some tubes.

b) Minor pitting were observed at the shell and tube sheet surface.

c) Thickness measurement was carried out. Refer Annexure-D

(19) T-1301 (AMMONIA WATER TANK) :

a) Brown coloration on bottom plate and bottom half of shell and silver bright colouration on top half of shell was observed.

b) Bottom plate was found bulged up-side at different locations. Same has been observed in past.

c) Welding 3" NB tank drain nozzle connection and 4" NB nozzle for P-1426 A/B suction were found with severe bead depression, lumps and slag. Proper dressing was recommended.

d) Thickness measurement was carried out. Refer Annexure-D

CODE NO JOB DESCRIPTION

(20) T-1301-A (NEW AMMONIA WATER TANK) :

a) Brown coloration on bottom plate and bottom half of shell and silver bright coloration on top half of shell was observed.

b) No other defect was observed. In general, the overall condition of the tank was found satisfactory.

c) Thickness measurement was carried out. Refer Annexure-D.

(21) T-1401 (UREA SOLUTION TANK) :

a) Bottom plate is having bulging upside as has been observed in the past.

b) Seal welding of old and new tank interconnection pipe with shell provided at bottom and top was found intact.

c) Dark brown coloration was observed .

d) Stiffner provided on top roof plate was found intact in position.

e) Thickness measurement was carried out. Refer Annexure-D

(22) T-1401-A (NEW UREA SOLUTION TANK) :

a) Brownish gray coloration was there on bottom half of the vessel and top half was observed having bright silver coloration.

b) Overall condition of the tank was satisfactory.

c) Thickness measurement was carried out. Refer Annexure-D

(23) T-1501 (CONDENSATE TANK) :

Visual inspection of internals was carried out. No abnormality was observed.

a) The internals (shell and dished ends) had assumed brownish colouration.

b) Scattered minor scales were observed on tank internal surface.

c) Overall condition of the tank was found satisfactory.

CODE NO JOB DESCRIPTION

(24) V-1101 (CO2 KNOCK OUT DRUM) :

a) Epoxy paint was found peeled off from many locations and metal was found exposed at few locations. Rectification of the same was advised.

b) Demister pad supporting ring fasteners were found loose and missing at two places, however Demister pads were found intact in position.

c) Demister pads were found partially covered with peeled off epoxy paint.

(25) V-1102 (NH3 SUCTION FILTER) :

Visual inspection of the vessel was carried out from inside. The observations were as below.

a) Some oil sludge was found accumulated at the bottom of the vessel..

b) Wire mesh filter was found in damaged condition

c) Overall condition of the equipment was found satisfactory.

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

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

a) Coloration of shell was blackish gray.

b) The condition of longitudinal and circumferential weld joints was satisfactory.

c) Oil layer was found on the shell and bottom dished end.

d) A pinhole of approx. 2mm dia. X 5 mm depth was observed on the welding of 11/2" line for low level troll, repairing was recommended.

e) Overall condition of the equipment was found satisfactory.

CODE NO JOB DESCRIPTION

(27) V-1202 (RECTIFYING COLUMN) :

Top Compartment :

a) Coloration of shell top portion was observed gray where as grayish brown coloration was observed on bottom portion.

b) Perforated grating was found intact in position.

From Bottom manhole :

a) Coloration of top cone was silver with black patches where as brownish coloration was found on bottom dished end.

b) Condition of bottom nozzle weld joint was found satisfactory.

c) Metallic scales up to 2.5 mm thickness were observed at the scatted locations on shell and dish end. Thickness below these locations was found satisfactory.

d) Thickness measurement was carried out. Refer Annexure-D

(28) V-1203 (L. P. ABSORBER) :

From Top End :

a) Coloration of shell was observed greyish black.

b) Grating was found distorted.

c) Spray nozzle (1 1/2"dia.) of NH3 water inlet from P-1304 C/D was found intact.

From Bottom End :

a) Coloration of shell was observed grayish black.

b) Seal welding of gas inlet nozzle with shell was found to have corrosion cavity of approx. 1 mm depth at one spot.

c) One no clamping bolt of sieve tray was found missing.

d) Center nozzle of bottom dish end found intact in position.

e) A pinhole of approx. 10 mm depth was observed on manhole to shell weld joint visually hence DP test of the same joint was carried out which had revealed lot of porosities/pinholes. Repair was recommended and same was checked by DP test and air soap solution test at 0.5 kg/cm^2 after repair.

CODE NO JOB DESCRIPTION

(29) V-1206 (ATMOSPHERIC VENT SCRUBBER) :

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

a) Demister pads were found intact.

b) All fasteners were found intact.

c) The shell coloration was grayish black.

(30) V-1207 (L. P. SCRUBBER) :

Visual inspection of the vessel internals was carried out from Top manhole. .The observations were as follows.

a) Coloration of shell top portion was observed blackish grey.

b) Corrosion attack was observed on the second circumferencial weld seam from top.

c) 2" dia. pipe located on south-east direction was found with seal welding with the shell from inside only on 80 % of its circumferential length.

d) Sieve tray was found damaged particularly near the clamping bolt holes. Some fasteners were found loose and few were found missing.

e) Grill supporting plate fasteners were found loosened and one was found missing.

f) Ammonia water inlet spray nozzle flange bolt was found loose.

g) Corrosion cavities of approx. 2 mm depth were observed on 3" NB nozzle located at top dished end.

(31) V-1301 (2ND DESORBER) :

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

Bottom Compartment :

a) The shell had assumed brownish coloration.

b) Bottom nozzle and nozzle on South side were observed to be in satisfactory condition.

c) All clamps were found intact in position One no. clamping bolt was found loose.

d) Condition of trays was found satisfactory.

CODE NO JOB DESCRIPTION

Top Compartment :

a) Shell coloration was found brownish.

b) All fasteners were intact except one which was found loose.

c) Thin oily sludge was found adhered on the trays ,shell and dished end.

d) All the trays were found satisfactory

e) Top nozzle was found satisfactory.

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

Visual inspection of vessel top and bottom compartment only was carried out .

Top Compartment :

a) Top dish end and shell of top section has assumed brownish black coloration.

b) Trays had brownish coloration.

c) Insulation of top dished end was found in damaged condition, repairing was recommended.

d) Few fasteners of the tray were found loosened.

e) Condition of trays was found satisfactory.

Bottom Compartment :

a) Brownish coloration was observed.

b) Perforated distributor pipe's clamp bolts were missing.

c) Three nos. clamping bolt of tray were found missing.

d) Oil layer was observed all around.

CODE NO JOB DESCRIPTION

(33) V-1352 (FIRST DESORBER) :

Visual inspection was carried out from top and bottom manhole.

Top Manhole :

a) Shell and dish end had brownish coloration.

b) All fasteners were found intact

c) Stitch welding of tray with vertical plate was found broken near manhole at west side.

Bottom Manhole :

a) Shell and dish end had brownish coloration.

b) All fasteners were found intact.

(34) V-1421 (FLASH DRUM SCRUBBER) :

a) Shell inside was found brownish in colour.

b) Welding of supporting ring for demister pad was found corroded at few locations.

c) Sign of carbamate leakage was observed from the tell tale hole of two nos. of saddle support reinforcement pads. DP test was carried out at these locations on east side of support. A crack was observed on south side of support whereas porosity's were observed on north side of support, the same were marked for repairs.

(35) V-1423 (1 ST STAGE EVAPORATOR SCRUBBER) :

Visual inspection was carried out from top manhole.

a) Dark brown coloration was observed.

b) Demister pads were observed to have sagging at few scattered locations and partial damage was also observed.

c) Few fasteners were found missing and some fasteners were found loose.

d) Overall condition of the vessel was satisfactory.

CODE NO JOB DESCRIPTION

(36) V-1501 (4 ATA STEAM DRUM) :

a) Coloration of shell was blackish brown in general.

b) Demister pads were found intact and in good condition.

c) Minor pittings and hard scales were observed on both side of dished end.

d) 3 nos. fasteners on west side riser baffle plate were found missing where as 1 no. was found missing on east side.

e) Stitch welding of east side riser baffle plate was found cracked in complete length.

f) Distributor pipe support welding was found corroded up to approx. 2 mm depth at many locations.

g) Welding of the west side vertical supporting plate of demister pad with the shell was found eaten away up to approx. 2mm depth in approx. 70 % of its length..

h) Welding of the supporting plate for demister pad at overhead position was found porous up to approx. 1.5 mm depth.

i) A porosity was observed on the welding of north dish end to shell welding.

j) Thickness measurement was carried out. Refer Annexure-D

(37) 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) Vessel inside has assumed brownish black in colouration.

d) Thickness measurement was carried out. Refer Annexure-D

CODE NO	JOB DESCRIPTION

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

a) Colouration of Shell and dished end was observed grayish black for the bottom half where as brownish gray for top half.

b) Complete internal surface of vessel was found covered with fine dust particles.

c) Scattered scales were observed on both the dished ends.

d) Overall condition of the vessel was found satisfactory.

(39) V-1811 (Ist STAGE SEPERATOR):

a) No abnormalities were observed

b) Overall condition of the vessel found satisfactory.

(40) V-1812 (Iind STAGE SEPARATOR) :

a) No abnormalities were observed.

b) Overall condition of the vessel found satisfactory.

(41) V-1813 (IIIrd STAGE SEPARATOR) :

a) No abnormalities were observed

b) Overall condition of the vessel found satisfactory.

CODE NO JOB DESCRIPTION

02 41 04 THICKNESS MEASUREMENT :

Also thickness measurement of following heat exchangers and vessels was also carried out. The readings are given at the table, Annexure - D.

SR. NO.	EQUIPT.NO.	EQUIPMENT NAME
1	H-1202	H.P. Condenser (Liner)
2	H-1205/A	Additional LP Carbamate Condenser
3	H-1422/A	Urea solution CCS II Heat Exchanger
4	T-1814	Main Lub oil tank for K-1801
5	T-1815	Over head Lub oil tank for K-1801
6	V-1204	Steam condensate Pot for H-1204
7	V-1205	LP Carbamate Seperator
8	V-1353	Level tank for Reflux condenser
9	V-1401	1st Stage evaporator Condenser Pot

02 41 05 PIPE LINES THICKNESS MEASUREMENT :

During this shutdown, a large nos. of pipe lines were examined for thickness. The detailed report on thickness measurement is enclosed herewith at Annexure - E attached here with.

CODE NO JOB DESCRIPTION

ANNEXURE-A

QUALITY CHECK PLAN FOR LINER REPLACEMENT OF TOP COMPARTMENT

Sr. No	Description of Items	First Shell Course		Dished End		Man way		Remarks
		L & T	IFFCO	L & T	IFFCO	L & T	IFFCO	
1	Grinding and removal of existing lining plates without damage to carbon steel surface							
2	Visual inspection,MPI & thickness measurement of CS Shell surface after proper cleaning.							
3	Confirmation of weep holes on liner removed area for their clear passage of air.							
4	Buffer payer thickness checking with permascope to be carried out.							
5	Fabricate the new liner plates as per required dimension in the drawing							
6	Ensure the backing strips used for liners tacking between CS shell & liner meets the actual dimension(trapezoidal), clean & passivated.							
7	Tacking of backing strips with preheating at min. 90 deg. to the CS shell surface properly.							
8	Install new liner in position & tack weld provided required gap & dimensional requirements.							
9	Gap checking after fit-up with the CS surface to liner							
10	DPT of weld edge preparation for the long seam & circular seams.							
11	Thorough cleaning after fit-up by using SS wire brushes to be ensured.							
12	Complete the root run by using TIG with low heat input without damaging the backing stripe.							
13	Ensure proper argon back purging of root pass welding.							
14	Visual & DPT check after root pass.							
15	Ensure ferrite check after root within the limits.							

CODE NO JOB DESCRIPTION

ANNEXURE-A

Sr. No	Description of Items	First Shell Course		Dished End		Man way		Remarks
		L & T	IFFCO	L & T	IFFCO	L & T	IFFCO	
16	Air and soap solution test at 0.2 Kg/cm^2 using DM water.							
17	Gap checking after root welding with permascope.							
18	Ensure after final welding the segments of liner plates are free of distortion.							
19	Ensure final/cover passes cleaned with SS wire brushes.							
20	Visual & DP check after final welding.							
21	Ferrite check after final welding.							
22	Gap checking after final welding with permascope.							
23	Rectification of repairs / defects if any.							
24	Ensure cleaning & passivation of the new welds as per procedure..							
25	Ammonia leak test as per procedure.							
26	Hydrotesting.							

ANNEXURE-A1

Measurement of gap between liner plate and CS shell was carried out using permascope after fit-up, root run welding, final welding and hydrotest as per the QA plan. The readings of the same after final welding and hydrotest were found as under.

(A) **Gap between dished end liner petals and dished end shell :**

AFTER FINAL WELDING			AFTER HYDROTEST		
Liner Petal No.	Gap Observed in MM		Liner Petal No.	Gap Observed in MM	
	Minimum	Maximum		Minimum	Maximum
1	6.77	14.09	1	2.9	4.36
2	7.02	13.5	2	2.81	5.02
3	8.1	15.97	3	2.81	4.14
4	8.88	13.15	4	2.48	4.42
5	13.25	19.45	5	2.8	3.9
6	5.37	15.51	6	2.67	4.27
7	7.54	17.33	7	2.59	4.26
8	8.32	17.36	8	2.92	3.82
9	7.67	18.42	9	2.92	5.21
10	14.96	20.75	10	2.72	4.63
11	5.23	14.12	11	2.85	3.61
12	9.72	18.42	12	2.76	3.32

(B) **Gap between top course shell liner plates and shell :**

AFTER FINAL WELDING			AFTER HYDROTEST		
Liner Plate Segment No.	Gap Observed in MM		Liner Plate Segment No.	Gap Observed in MM	
	Minimum	Maximum		Minimum	Maximum
A	2.03	9.75	A	2.52	5.29
B	2.36	11.85	B	2.35	4.66
C	2.24	12.92	C	2.27	4.16

(C) **Gap between many liner plates and shell :**

AFTER FINAL WELDING			AFTER HYDROTEST		
Liner Plate	Gap Observed in MM		Liner Plate	Gap Observed in MM	
	Minimum	Maximum		Minimum	Maximum
A	2.85	7.06	A	2.69	3.79

CODE NO JOB DESCRIPTION

ANNEXURE-B

Sr. No.	Description of Items.	Insert Liner (Compartment 10)		Remarks
		L & T	IFFCO	
1	Grinding & removal of existing lining plates without damage to loose liner plates on the CS shell surface circumferentially.			
2	Visual inspection of loose liner after proper cleaning			
3	Confirmation of weep holes behind the loose liners for their clear passage.			
4	Install new insert liner in three segments & tack weld providing required gap and dimensional requirements to suit site conditions.			
5	PT of weld edge preparation for the long seam & circular seam.			
6	Thorough cleaning after fit-up by using SS wire brushes to be ensured.			
7	Ensure proper argon back purging of root pass welding.			
8	Complete the root run by using GTAW with low heat input without damaging the loose liner assembly.			
9	Visual & PT check after root welding.			
10	Ensure ferrite check after root within the limits.			
11	Gap checking after root welding with permascope.			
12	Air and Soap solution test at 0.2 Kg/cm^2 using DM water.			
13	Ensure after final welding the segments of insert liner pates are free of distortion.			
14	Ensure final/cover passes cleaned with SS wire brushes.			
15	Visual & DP check after final welding.			
16	Rectification of repairs / defects if any.			
17	Ferrite check after final welding.			
18	Gap checking after final welding with permascope.			
19	Ensure cleaning & passivation of the new welds as per procedure..			
20	Hydrotesting.			
21	PT after hydrotesting.			
22	Ammonia leak test as per procedure.			

CODE NO JOB DESCRIPTION

ANNEXURE-B1

Measurement of gap between insert liner plate and CS shell was carried out using permascope after fit-up, root run welding, final welding and hydrotest as per the QA plan. The readings of the same after final welding and hydrotest were found as under.

(A) **Gap between insert liner plates and shell :**

AFTER FINAL WELDING			AFTER HYDROTEST		
Insert Liner Plate Segment No.	Gap Observed in MM		Insert Liner Plate Segment No.	Gap Observed in MM	
	Minimum	Maximum		Minimum	Maximum
A	14.34	18.7	A	10.44	12.98
B	13.75	16.61	B	12.11	14.13
C	13.67	18.26	C	10.07	15.47

ANNEXURE-C

Sr. No.	Description of Items.	Bulged Liner (Compartment 11)		Remarks
		L & T	IFFCO	
1	Grinding & removal of existing lining plates without damage to loose liner plates on the CS shell surface circumferentially.			
2	Visual inspection,MPI & thickness measurement of CS Shell surface after proper cleaning.			
3	Insert & tack weld 3 mm thick backing strip circumferencially in the existing top and bottom liner shell after pickling & passivation.			
4	Insert and tack weld 5 mm thick filler strip inside the existing 39 mm width groove provided on carbon steel surfaces by providing 8 mm gap between segments.			
5	Ensure the backing strips used for liners tacking between CS shell & liner meets the actual dimension(trapezoidal), clean & passivated.			
6	Mark & make 27 slots of size 12 mm width x 112 mm long on three liner segments by maintaining the pitch of 200 mm.			
7	Ensure tacking of backing strips with preheating at min. 90 deg.C to the CS shell surface properly.			
8	Ensure the slots made on the liner plates do not coincide with the transition between the filler strip segments & tray support cleats.			

CODE NO JOB DESCRIPTION

Sr. No.	Description of Items.	Bulged Liner (Compartment 11)		Remarks
		L & T	IFFCO	
9	Install new liner in position & tack weld provided required gap & dimensional requirements.			
10	Gap checking after fit-up with the CS surface to liner			
11	DPT of weld edge preparation for the long seam & circular seams.			
12	Thorough cleaning after fit-up by using SS wire brushes to be ensured..			
13	Ensure proper argon back purging of root pass welding.			
14	Complete the root run by using GTAW with low heat input without damaging the loose liner assembly.			
15	Visual & DP check after final welding.			
16	Ensure ferrite check after root within the limits.			
17	Gap checking after root welding with permascope.			
18	Air and Soap solution test at 0.2 Kg/cm^2 using DM water.			
19	Ensure after final welding the segments of insert liner pates are free of distortion.			
20	Ensure final/cover passes cleaned with SS wire brushes.			
21	Visual & DP check after final welding.			
22	Rectification of repairs / defects if any.			
23	Ferrite check after final welding.			
24	Install & tack weld all the tray support cleats as per required location on the liner plate..			
25	Ferrite and PT check after root pass for the tray support cleats.			
26	Final welding for the cleats & PT check to be confirmed.			
27	Gap checking after final welding with permascope.			
28	Ensure cleaning & passivation of the new welds as per procedure..			
29	Hydrotesting.			
30	PT after hydrotesting.			
31	Ammonia leak test as per procedure.			

CODE NO JOB DESCRIPTION

ANNEXURE-C1

Measurement of gap between liner plate and CS shell was carried out using permascope after fit-up, root run welding, final welding and hydrotest as per the QA plan. The readings of the same after final welding and hydrotest were found as under.

(A) Gap between liner plates and shell :

AFTER FINAL WELDING			AFTER HYDROTEST		
Insert Liner Plate Segment No.	Gap Observed in MM		Insert Liner Plate Segment No.	Gap Observed in MM	
	Minimum	Maximum		Minimum	Maximum
A	9.42	10.83	A	2.73	6.21
B	6.11	20.31	B	2.19	4.49
C	4.58	13.68	C	2.65	4.71

CODE NO JOB DESCRIPTION

Annexure - D

EQUIPMENT THICKNESS MEASUREMENT DATA OF S/D APRIL 2002 (UREA PLANT):

SL. NO.	EQUIP. NO.	EQUIPMENT DESCRIPTION	SHELL THICKNESS IN MM			DISH END THICKNESS IN MM			CHANNEL THICKNESS IN MM		
			DESIGN	MEASURED MIN.	% RED.	DESIGN	MEASURED MIN.	% RED.	DESIGN	MEAS-URED MIN.	% RED.
1	H-1104	CO2 SPRAY COOLER	10	9.7	3	13	11.2	13.8**	-	-	-
2	H-1202	H.P. CONDENSER (LINER)	6.0	4.5	25	-	-	-	-	-	-
3	H-1205/A	ADDITIONAL L.P. CARBAMATE CONDENSER	12	12.1	10	10	9.5	5	8	8	-
4	H-1422 A	UREA SOLUTION CCS II HEAT EXCHANGER	-	8.1	-	-	7.8	-	-	-	-
5	H-1424	2ND STAGE EVAPARATOR SEPERATOR	10	8.3	17	12	8.9	25.83			-
6	H-1815	SURFACE CONDENSER	-	14.9	-	-	11.6	-	-	-	-
7	T-1301	LEAN AMMONICAL WATER TANK	6	5.8	3.33	5.0 (ROOF), 7.0(BOT.)	4.7(ROOF) , 7.3(BOT.)	6 ((ROOF),	-	-	-
8	T-1301 A	STRONG AMMONICAL WATER TANK	6	5.3	11.66	5.0 (ROOF),	5.3 (ROOF),	--	-	-	-
9	T-1401	UREA SOLUTION TANK	6	5.6	6.6	6	5.9(BOT.)	6.6	-	-	-
10	T-1401 A	UREA SOLUTION TANK	6	5.8	3.3	6	-	-	-	-	-

CODE NO JOB DESCRIPTION

SL. NO.	EQUIP. NO.	EQUIPMENT DESCRIPTION	SHELL THICKNESS IN MM			DISH END THICKNESS IN MM			CHANNEL THICKNESS IN MM		
			DESIGN	MEASURED MIN.	% RED.	DESIGN	MEASURED MIN.	% RED.	DESIGN	MEAS-URED MIN.	% RED.
11	T-1814	MAIN LUB OIL TANK FOR K-1801	N.A.	5.6							
12	T-1815	O.H.LUB OIL TANK FOR K-1801	N.A.	5.6	-	-	-	-	-	-	-
13	V-1201	AUTOCLAVE	107 (Shell), 75(Man -way)	1 09.1(Shell), 74.5(Man -way)		55/107	57.8/93.3	-	5(Lincr)	4.3	14
14	V-1202	RECTIFYING COLUMN	9.52	9.5	-	9.52	11.3	-	-	5.6(cone)	-
15	V-1204	STEAM CONDENSATE POT FOR H-1204	-	8.2	-	-	7.9	-	-	-	-
16	V-1205	LP CARBAMATE SEPARATOR	7	7.6	-	7	9.3	-	-	-	-
17	V-1353	LEVEL TANK FOR REFLUX CONDENSER	-	5.9	-	-	5.3	-	-	-	-
18	V-1401	IST STAGE EVAPORATOR CONDENSER POT		8.3			7.7				
19	V-1501	4 ATA STEAM DRUM	15	14.4	4	18	15.9	11.66	-	-	-
20	V-1502	23 ATA STEAM DRUM	30	29.8	-	37	36.2	2.1	-	-	-

**** (H-1104) Stainless steel lining was provided on the shell (Bottom Comp.) inside surface due to heavy localized corrosion channeling.**

CODE NO JOB DESCRIPTION

Annexure - E

PIPELINE THICKNESS MEASUREMENT DATA OF S/D APRIL 2002 (UREA PLANT):

SR NO.	LINE NO.	N.B. (in.)	SCH.	LINE DESCRIPTION		MIN.THK. OBSERVED	%GE RED	REMARKS
				FROM	TO			
1	GA-1109	12	B2	GA-1104	GA-1114	8.9	13.67	
2	GA-1112	6	F2/14.2	K-1101-2	GA-1201	10.1	29.22	
3	GA-1202	1	F2/6.3	GA-1112-6"	CHECKVALVE (GA-1203)	4.6	27	
4	GA-1203	1	X1/4.5	GA-1202	SCRUBBER	3.5	22.2	
5	MA-1102	6	C2	H-1102	V-1102	5.8(April99)	18.42	
6	MA-1105	6	7.11	V-1103	P-1102	5.8(APRIL98)	18.42	
7	MA-1106	6	14.27	MA-1605	MA-1203	13.1	8	Replaced in March 2000
8	MA-1106	4	8.55	P-1102/A	MA-1605	7.3	14.7	
9	MA-1107	4	6.02	MA-1104	MA-1116	5.5	8.6	
10	MA-1116	4	6.0	MA-1106	V-1103	7.1(March2k)	-	
11	MA-1122	6	7.11	MA-1105	P-1102/B	5.9	17	
12	MA-1123	4	8.56	P-1102/B	MA-1605	7.5	17.9	
13	MA-1126	4	8.56	MA-1123	MA-1116	7.6(March2k)	11.21	
14	MA-1201	3	7.62	MA-1106	MA-1202	6.5(March2k)	14.69	
15	MA-1202	3	7.62	MA-1201	V-1201	7.4	2.88	
16	MA-1603	6	C2(7.11)	V-1103	P-1102/C SUC.	6.5	8.57	
17	MA-1604	4	8.56	MA-1604-3"	MA-1605-6"	4.9	35.7	
18	MA-1604	3	7.62	P-1102 / C DIS.	MA-1604-4"	5.2	31.75	2 elbows replaced
19	MA-1605	6	14.27	MA-1106	MA-1203-1"	13.1	8.1	
20	MA-1607	4	8.56	MA-1605	MA-1116	5.2	39.5	
21	PR-1201	8	19.58	V-1201	H-1201	15.1(M-2001)	22.8	Minor pittings
22	PR-1202	10	24.33	HP-STRIPPER H-1201	HP-CONDENSER	22.1	9.16	
23	PR-1203	8	19.58	HP-CONDE-NSER H-1203	V-1201(VAPOR LINE)	16.6	15.21	
24	PR-1204	8	19.58	HP-CONDE NSER	V-1201(LIQUID LINE)	16.7	14.7	
25	PR-1205	8	19.5	STRIPPER BOTTOM	PR-1205-6"	17.1	12.66	Minor pittings

CODE NO JOB DESCRIPTION

SR NO.	LINE NO.	N.B. (in.)	SCH.	LINE DESCRIPTION		MIN.THK. OBSERVED	%GE RED	REMARKS
				FROM	TO			
26	PR-1205	6	15.2	STRIPPER	RECTIFYING COLUMN	11.9	21.9	
27	PR-1208	4	10.4	AUTOCLAVE TOP	SCRUBBER	7.7	26	Minor pittings
28	PR-1208	4	10.16	ISOLATION VALVE	HICV-1202	10.2		
29	PR-1210	10	X6	HICV-1202	L.H.V.	4.2(Mar-01)	29.9	
30	PR-1211	1.5	5.08	PR-1208	PR-1212	4.2	17.3	
31	PR-1212	4	10.4	SCRUBBER	AUTOCLAVE BOTTOM	8.4(APRIL98)	19.23	
32	PR-1213	2	5.54	PR-1201	PR-1205	4.3	22.4	
33	PR-1214	8	X6(4.57)	V-1202	H-1204	3.6	21.2	
34	PR-1214	12	X6(4.57)	V-1202	H-1204	3.7(April98)	20.7	
35	PR-1216	18	X6	V-1202	H-1205	4.8		
36	PR-1217	10	X3	RV-1202	PR-1309	4.3		
37	PR-1224	3	7.62	P-1201B	PR-1638-4"	5.9	22.6	
38	PR-1225	3	7.62	DISCHARGE LINE OF P-1201 A/B		6.6	13.38	8 nos. of elbows replaced
39	PR-1230	6	15.24	HP-CONDENSERTOP(MA-1203)	H-1202	14	8.13	
40	PR-1231	3	8.13	H-1203	PRCV-1201	6.1	25	
41	PR-1234	4	X4/10.41	PRC-1201(H-1203)	V-1203	8.5(April99)	18.3	
42	PR-1301	4	X3	T-1301	P-1302A	2.3	24.5	
43	PR-1309	20	X3	T-1301	PR-1310	4.3		
44	PR-1310	20	B1	PR-1309	ATMOS	5.9		
45	PR-1351(C.S.)	4	3.05	V-1301	H-1301A/B/C	4.4		
46	PR-1351(S.S.)	4	3.05	V-1301	H-1301A/B/C	2.2	28	
47	PR-1359	4	X7 / 3.05	P-1351A/B	H-1351C	2.1(April 98)	31.1	
48	PR-1361	4	X7A	V-1351	1351-A	2.4	21.3	
49	PR-1373	4	X3 / 3.05	P-1351B DIS	PR-1361	2.1	31.1	
50	PR-1404	4	X3	P-1401	V-1409	2.1	31	

CODE NO JOB DESCRIPTION

SR NO.	LINE NO.	N.B. (in.)	SCH.	LINE DESCRIPTION		MIN.THK. OBSERVED	%GE RED	REMARKS
				FROM	TO			
51	PR-1407	6	X10	H-1424	P-1408	3	1.6	
52	PR-1413	3	X3	P-1421	ATMOS	2.6	14.7	
53	PR-1416	2	X10	H-1423	P-1422	2.3	16.9	
54	PR-1419	36	X10	H-1424	P-1423	9.4		
55	PR-1420	30	X10	P-1423	H-1425	6.1	3.9	
56	PR-1421	16	X10	H-1425	P-1424	4.7	1.6	
57	PR-1422	12	X10	P-1424	H-1426	4.5	1.5	
58	PR-1424	2	X10	H-1426	P-1425	2.7	2.5	
59	PR-1440	30	7.92	H-1422	H-1423	9.7		
60	PR-1440	32	7.92	H-1422	H-1423	9.6		
61	PR-1444	20	X10	V-1406	V-1421	6		
62	PR-1446	14	X10	V-1421	H-1421	4.7	1.6	
63	PR-1458	4	3.05	H-1421	P-1421	2.9	4.9	
64	PR-1602	3	3.05	P-1304C/D	V-1203	2.3	24.5	
65	PR-1602	2	2.77	P-1304C/D	V-1203	2.4	13.3	
66	PR-1637	3	7.62	P-1201C	PR-1638-4"	6.7	12.07	
67	PR-1638	4	10.4	P-1201A/B/C	PR-1230-6"	12.6	-	
68	PW-1103	8	9.53	B/L(DM PLANT)	H-1104	3.7	61.15	Replaced in April 99, as 48.7% red. observed in April99
69	PW-1303	3/4	B1/4.85/ 5.4	H-1303	B/L	4.7/4.5(March 01)	3.09/1 6.66	
70	PW-1351	4	3.05	H-1301	V-1301	1.8	40.9	
71	PW-1351	6	3.4	H-1301	V-1301	2.9	14.7	
72	PW-1512	4	3.05	H-1502	BAT. LIMIT	2.3	24.59	
73	PW-5152	4	3.05	DM WATER	H-1502	2.3	24.59	
74	SC-1212	10	9.27	SC-1210	SC-1209	7.8	16.12	
75	SC-1212	10	9.27	SC-1210	SC-1209	7.8	16.12	

CODE NO JOB DESCRIPTION

SR NO.	LINE NO.	N.B. (in.)	SCH.	LINE DESCRIPTION		MIN.THK. OBSERVED	%GE RED	REMARKS
				FROM	TO			
76	SC-1239 III FROM NE	16	9.525 (B4)	H-1202	V-1501	7.2(Mar-01)	24.4	
77	SC-1239 III FROM NE	16	9.525 (B4)	H-1202	V-1501	7.2(Mar-01)	24.4	
78	SC-1243 III FROM NW	16	9.525 (B4)	H-1202	V-1501	6.8(Mar-01)	28.6	
79	SC-1243 III FROM NW	16	9.525 (B4)	H-1202	V-1501	6.8(Mar-01)	28.6	
80	SC-1407	3	5.49	H-1422	T-1501	1.9	65.4	Bend replaced.
81	SC-1407	8	8.18	H-1422	T-1501	4.7	42.54	
82	SC-1407	8	8.18	H-1422	T-1501	4.7	42.54	
83	SC-1409	4	B4	H-1424	T-1501	4.8	20	
84	SC-1409	4	B4	H-1424	T-1501	4.8	20	
85	SC-1504	4	B4(6.02)	V-1503	V-1501	4.8	20.2	Replaced in Oct. 99 with S.S.
86	SC-1504	6	B4(6.02)	V-1503	V-1501	5.6	21.23	Replaced in Oct. 99 with S.S.
87	SC-1504	6	B4(6.02)	V-1503	V-1501	5.6	21.23	Replaced in Oct. 99 with S.S.
88	SC-1504	4	B4(6.02)	V-1503	V-1501	4.8	20.2	Replaced in Oct. 99 with S.S.
89	SC-1506	4	B4(6.02)	T-1501	P-1505	5.0(MAY97)	16.9	
90	SC-1506	4	B4(6.02)	T-1501	P-1505	5.0(MAY97)	16.9	
91	ST-1100, 4 ATA STEAM HEADER	14/20	9.53			10.0/8.7	-/8.66	
92	ST-1101, 40 ATA STEAM HEADER	4/2	6.02/3.91	BOILER	Q-1113A	5.8/4.0	3.65/-	
93	ST-1104	8	E3/12.7	B/L	Q-1101-2	9.5	25.1	
94	ST-1104	8	E3/12.7	B/L	Q-1101-2	9.5	25.1	
95	ST-1104, 60 ATA STEAM HEADER	8	12.7	BOILER		11	13.38	
96	ST-1205	12	C1(9.52)	V-1502	H-1201	7.3(SEP93)	23	
97	ST-1205	12	C1(9.52)	V-1502	H-1201	7.3(SEP93)	23	

CODE NO JOB DESCRIPTION

PIPELINES ON TOP PIPE RACK:

SR. NO.	LINE DESCRIPTION	SIZE INCH	MIN. MEASURED THK.mm
1	INSTRUMENT AIR HEADER	4	5.1
2	RAW WATER HEADER FOR OPEN CHANNEL DILUTION IN BOILER (GREEN)	4	5.3
3	H-1422 CONDENSATE TO PUMP	6	4.8
4	DM WATER SUPPLY HEADER	4	2.5
5	HYDROLYSER RV DARIN TO T-1301	2	1.9
6	AG HEADER (YELLOW)	4	3
7	23 ATA STEAM HEADER	12	9.1
8	4 ATA STEAM HEADER	8	7.8
9	BFW TO AMM.PLANT FROM BOILER	6	9.3
10	40 ATA STEAM HEADER	1.5	4.7
11	LEAN AMMONICAL WATER FROM NH3 PLANT	2	2.2

PIPELINES ON BOTTOM PIPE RACK

SR. NO.	LINE DESCRIPTION	LINE SIZE INCH	DESIGN THK mm	FROM	TO	MIN.MEASURED THK IN mm	% RED.
1	SC-1106 SURFACE CONDENSING O/L	4	6.02	P-1114 A/B	BOILER	5.8	3.65
2	ST-1104, 60 ATA STEAM HEADER	8	12.7	BOILER		11	13.38
3	ST-1100, 4 ATA STEAM HEADER	14/20	9.53			10.0/8.7	-/8.66
4	ST-1101, 40 ATA STEAM HEADER	4/2	6.02/3.91	BOILER	Q-1113A	5.8/4.0	3.65/-
5	CW-1403 CW INLET HEADER	30	9.53			8.4	11.81
6	CW-1405 CW OUTLET HEADER	30	9.53			8.5	10.76

CODE NO JOB DESCRIPTION

PIPELINES ON MIDDLE PIPE RACK

SR. NO.	LINE DESCRIPTION	SIZE INCII	MIN. MEASURED THK.mm
1	P-1505 DISCHARGE TO SUMP	3	5.7
2	OVER HEAD L.O. TANK(Q/K 1101-1/2") INLET IIEADER	3	2.8
3	OVER HEAD L.O. TANK(Q/K 1101-1/2")OUTLET HEADER	3	4.4
4	CCS II MAKE UP LINE FROM BFW HEADER	1/2	3.6
5	RAW WATER IIEADER (SERVICE STATION)	1	3.5
6	RAW WATER HEADER	1 1/2	2.7
7	DRINKING WATER TO BOILER/STORAGE	1	3.6
8	DRINKING WATER HEADER	4	4.1
9	RAW WATER TO STORAGE	2	3.3
10	GARDENING WATER HEADER	6	6.4
11	I.G. FROM I.G. PLANT FOR BOILER/STORAGE	2	4.3
12	AMMONICAL WATER FROM DM PLANT TO T-1301	3	4.3
13	A.G. HEADER TO BOILER/STORAGE	1	4.4
14	PI.ANT AIR HEADER	3	3.3
15	INSTRUMENT AIR HEADER	3	4.6
16	I.EAN AMMONICAI. WATER (FROM NH3 PI.ANT) HYDROLYSER RV O/L HEADER TO T-1301	2	2.2
17	NAPHTHA FROM STORAGE TO NH3 PI.ANT	4	4
18	23 ATA STEAM TRACING LINE HEADER	1/2	3.6
19	4 ATA STEAM SUPPLY HEADER TO STORAGE	8	7.5

18

PLANT TURNAROUND - MARCH - APRIL - 2002

UREA PLANT

CIVIL JOBS

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

1. Repairing of scrapper floor by filling the joints of existing tiles / replace damaged acid proof tiles etc.
2. Providing and laying bitumastic on the top of Prill tower and prill bucket room.
3. Epoxy painting of RCC structure Prill bucket room, Lift cabin room, Stair case at Prill tower top level / inside scrapper floor etc.
4. Concrete protection taken by IP net coating outside surface of prill tower up to 8 meter height from ground floor.
5. Flooring with clay tiles was provided in MCC of prill tower.

18

PLANT TURNAROUND - MARCH - APRIL - 2002

UREA PLANT

ELECTRICAL JOBS

CODE NO	JOB DESCRIPTION

02 61 01 **ELECTRICAL JOBS :**

1. Maintenance job carried out on following transformer: TR-7A, TR-7B.

   a) Inspection of primary and secondary cable boxes, end termination, checking and tightening of connection

   b) Insulation resistance measurement of winding in primary and secondary side.

   c) Filtration of oil.

   d) Checking of marshaling box and measurement of breakdown value of oil.

2. Preventive maintenance of all the feeder compartment in MCC 6 and MCC 14, MCC 15 (Normal Section) were carried out.:

   a) Checking the tightness of outgoing terminal.
   b) Cleaning the feeder compartment.
   c) Replacement of damaged/ worn out contacts, etc.

3. Testing and calibration of all the relays installed on the feeder .

4. Preventive maintenance of following MOV were carried out : MOV1101, MOV 1102, MOV 1201, MOV 1202, MOV1501 & MOV 1801

5. Retermination of cables at both ends connected between Transformer LT side to incoming breakers in MCC-6 Section- B by replacement of finger grip contact with cable lug end termination.

6. Overhauling of following motors were carried out :

   P-1302/A, P1501, K1702, P1131/B, P1231/B, P1131/A, P1231/A, P1408, M1402/1, M1402/2, M1403/2, M1421, M1419, M1401/A, M1401/B, M1403/1

7. Preventive maintenance carried out on the rope switches of all conveyors.

PLANT TURNAROUND - MARCH - APRIL - 2002

UREA PLANT

INSTRUMENTATION JOBS

CODE NO	JOB DESCRIPTION

02 71 01 HITACHI (CO2) COMPRESSOR :

1. Local Control Panel, TLC Box and all field Instruments checked the wiring ,tightened the connection, cleaned the panel.

2. All RTDs and Thermocouples were checked. Replaced TI-1833 & TI-1834 RTDs by new RTDs.

3. All vibration probes, extension cables & proximeters were removed to facilitate Mech, Maint.,Checked, and installed back.

4. Provided support to Mech.Maint. Section for compressor related jobs.

5. Following trip and alarm switches were Cleaned, checked and Calibrated :

   PSLL-1801A/B/C, PSLL-1818A/B/C, PSIIII-1843A/B/C, PSL-1816, PSL-1844, PSL-1813, LSHH-1804, LSHH-1806, LSHH-1808, PSLL-1822, PSLL-1838A/B/C, PSHH-1839A/B/C, PSL-1812.

6. Replaced PSLL-1801C pressure switch with new one.

7. Checked Speed probes SE-1801, SE-1802, SE-1803.

8. Checked Key phasors KE-1801, KE-1802, KE-1803.

9. Calibrated following transmitters:

   LIC-1803, LIC-1805, LIC-1807, LIC-1821, PI-1802, PI-1809, FR-1801A(DCS),LT-1809, PT-1836.

10. Replaced FR-1801B (Anti surge) Transmitter by new transmitter.

11. Replaced FR-1803 (Rose mount) Transmitter by Fuji Transmitter.

12. Provided FR-0002 input to DCS directly from Boiler through signal multiplier installed in Boiler plant.

CODE NO	JOB DESCRIPTION

13. HICV-1801 control valve opened, plug and seat were replaced and overhauled.
14. Checked calibration and operation of LICV-1821A/B control valves in split range.
15. Provided new transmitter PT-1803 in 2nd suction of compressor.

02 71 02 OLD CENTRIFUGAL AND PB COMPRESSOR :

1. Following trip and alarm switches were calibrated :

   PHCO-1133, PHA-1133, PLCO-1101, PHCO-1127, PLCO-1124, PLCO-1145, PHCO-1126, PHCO-1132, PLCO-1166, LHCO-1123, PLCO-1153, PLCO-1167, PLCO-1160.

2. PLCO-1145 Pneumatic transmitter was calibrated.
3. KO Drum level High alarm LAH-1802 was Shifted from local panel to DCS.
4. Alarm switch LAII-1802 was calibrated.

02 71 03 CONTROL / MARSHALING ROOM :

1. DCS, ACDB, PDB, Vibration Cabinet and PLC Remote Control Panel were cleaned.
2. Vibration Monitor cards, relay cards and back plane were cleaned.
3. Wiring from new AAM-12T & AMM-12T cards to terminal strip in cabinet No.102 was carried out.
4. Cleaned All control and I/O cards of DCS were cleaned and battery voltage was checked.
5. Software Back-up of FCS and ICSs were taken and checked functionality of FCS and ICSs by running diagnostic software.
6. Extra cables lying under false flooring of Marshaling Cabinet Room were removed.
7. Old LRC-1201 radioactive Evaluation Unit LB-301was removed and installed two nos. of new Evaluation Units 440-1 for new stripper.
8. Replaced Woodward Governor with spare Woodward Governor.
9. Necessary support was provided to Inst. Offsite for installation and commissioning of UPS extension from ACDB to to Boiler PDB.

CODE NO	JOB DESCRIPTION

10. Checking of All MOVs were checked for remote operation from MOV panel in Urea Control Room.

11. Position indication for MOV-1501 (4 ata steam) was provided in DCS in coordination with Engg. Service Section.

12. The Radiac Relay of LR-1201 was calibrated for new source.

02 71 04 OTHER PLANT JOBS :

1. Following ISO Quality affecting instruments/transmitters were calibrated :

   PT-5303, PT-4405, PT-1121, PT-1145, PT-1201, PT-1202, PT-1422, PT-1421, PT-1105, PT-1802, SI-1401A, SI-1401B, FT-1201.

2. Following alarm and trip switches calibrated :

   PAHH-1194, PAH-1193, PHCO-1363A & B, PLCO-1102A, PLCO-1201A, PLCO-1201B, PALL-1195, PLCO-1102B,PS LL-1101, LSL-1357.

3. Autoclave radioactive source was replaced with new source.

4. Installed The source and detectors for level switch and continuous level measurement for new stripper were installed. Carried out the required wiring and cabling to connect the detectors to evaluation units mounted in Marshaling Room. The new level measurement system was calibrated and commissioned.

5. Overhauled Flush water flow switch FAL-1281 of carbamate Pump C was overhauled.

6. Necessary support was provide to General Engineering Section for installation of New CO_2 HP Stripper.

7. Jacket steam Vortex Flow meter body leak was attended.

8. Coordination was done with Production / Maint for Miscellaneous Plant jobs.

9. Separate 3/4" Inst. air header was provided for Anti surge Control Valve HICV-1801.

10. Capillary and Mono block valve of N/C Meter were replaced with spare ones.

11. All air regulators on the Prilling Tower Top Floor was replaced with new ones.

CODE NO	JOB DESCRIPTION

12. Following Local closed loops were taken in DCS :

    LIC-1204, LIC-1401, PIC-1221, TIC-1701A, TIC-1701B

13. Following pneumatic transmitters were replaced by smart transmitters :

    LICT-1204, PICT-1221, LT-1701A, LT-1701B, LICT-1201, LICT-1202.

14. Following I/P converters of critical loops were replaced by new Rose mount I/P converters :

    HICV-1201, LRCV-1201, FRCV-1421, LRCV-1421, LICV-1201.

15. All branch cables and multi-pair cables of Thermocouples were replaced with new extension cables. Four new Junction Boxes were installed for Thermocouple cables.

16. Few thermocouples were replaced with new ones.

17. Huge amount of old and unused air header, tubings, cables removed from the plant.

18. New transmitter PT-1102A ammonia pump A dish. pressure was installed and indication was provided on DCS.

19. Changed Impulse tubing of PT-1102B ammonia pump B disch pressure was changed as directed by safety committee.

02 71 05 HP VESSEL WEEP HOLES :

1. All peepholes of new HP stripper were checked & cleared and provided required fittings and tubing's.

2. Coordinated with Mech. W/S for clearing 3 nos. of weep holes in HP scrubber and checked & provided nipples & tubing's for these and other weep holes in the vessel.

3. Provided arrangement for passing inst. air/argon in weep holes for clearing weep holes and doing welding of liners in Autoclave in coordination with Mech. and Production.

4. Provided arrangement for carrying out Ammonia leak test in Autoclave in coordination with Production and Inspection.

CODE NO	JOB DESCRIPTION

02 71 06 CONTROL VALVES :

1. **PICV-1130** The control valve was opened from bonnet and checked the plug and seat. Lapping was carried out on seating surface and provided new gaskets. The I/P converter, Air filter regulator and positioner were overhauled and stroke was checked.

2. **PRCV-1504** The control valve was opened from bonnet and checked the plug and seat. Lapping was carried out on seating surface and provided new seat rings and gaskets. The I/P converter, Air filter regulator and positioner were overhauled and stroke was checked.

3. **HICV-1201** The control valve was removed from line and serviced. The plug was replaced with repaired one. Provided new Lens gaskets, upper guide sleeve, actuator diaphragm and packing. Provided new I/P converter and Air filter regulator. Overhauled the positioner and position transmitter .Lapping was done on seating surface of lens rings. Stroke was checked.

4. **LRCV-1201** The control valve was removed from line and serviced. Checked the plug and seat . Provided new upper guide sleeve, actuator diaphragm and packing. Provided new I/P converter and Overhauled the positioner and position transmitter. Lapping was done on seating surface of lens rings. Stroke was checked.

5. **LRCV-1421** New gland packing was provided . Checked the calibration.

6. **FICV-1283** Overhauled actuator. Checked positioner, I/P converter, air regulators.

7. **TICV-1701 A & B** Overhauled Valve positioner. Checked positioner, I/P converter, air regulators.

8. **TICV-1353** Opened and attended for not opening full. Checked positioner, I/P converter, air regulators.

9. Checking , cleaning , General overhauling of actuator , valve positioner, I/P converter , air regulator , plug and seat inspection and stroke checking of following valves.

FICV-1303	PICV-1353	LRCV-1501	LICV-1501	LICV-1101
LICV-1351	PICV-1351	LICV-1502A	TRCV-1422	FRCV-1102
FICV-1351	PICV-1129	LICV-1502B	HICV-1422	
LICV-1352	PICV-1502A	PRCV-1501	LICV-1420	
LICV-1353	PICV-1502B	TRCV-1421	FICV-1102	
HICV-1801	PICV-1810	LRCV-1201	HICV-1201	

10. Painting was done on all above control valves.

PLANT TURNAROUND - MARCH - APRIL - 2002

UREA PLANT

TECHNICAL DEPARTMENT JOBS

CODE NO	JOB DESCRIPTION

02 81 01 (A) **MECHANICAL JOBS :**

1) **BFW LINE REPLACEMENT:**

Approx. 54 meter long sagged line was replaced along with new spring supports (21nos.), after doing flexibility analysis.
Line size : 150 NB X Sch80, Material : A106 Gr.B

2) **REPLACEMENT OF HP STRIPPER(H - 1201) :**

HP Stripper of urea plant was replaced. In order to dismentle/erect the stripper, various pipelines were removed & same were re-erected after installation of new stripper as per enclosed annex ure - A. The replacement job was carried out by M/s Petron Engg. Ltd. Mumbai.

The detailed feature of the job are as follows :

a) Model of the crane-American 11250
b) Basic capacity of the crane 265 MT
c) Configuration of the crane-130 mast ,170 boom length, 26.5m working radius, No. of guy ropes = 2 at a distance of 80 m.

The equipment was mechanically designed and fabricated byM/s L&T, Powai Mumbai. The inspection was carried out by M/s LRIS (India). The UT of all tube to tube sheet joint & base line wall thickness were measured by M/s Force Institute, Denmark. All the tubes were cleaned by hydrojetting at site. After erection the verticality of the tubes was checked by passing piano wire through the tubes. The plumb was found 3 - 4 mm out which was within acceptable limit. The differential pressure measurement of all the ferrules was also carried out. In the new stripper the ferrules need not be tacked with hold down plate unlike old stripper.

3) **ELECTRICAL JOB :**

Percentage opening - closing indication of 4 ata steam MOV in urea plant DCS panel is provided.

PLANT TURNAROUND - MARCH - APRIL - 2002

OFFSITE & UTILITY PLANT

MECHANICAL JOBS

CODE NO **JOB DESCRIPTION**

03 02 01 **COOLING WATER PUMP (P-4401/A) :**

OVERHAULING OF PUMP :

(a) Coupling between the pump and the gear box was de-coupled after recording the necessary match marks.

(b) Top casing of the pump is removed and internals found okay.

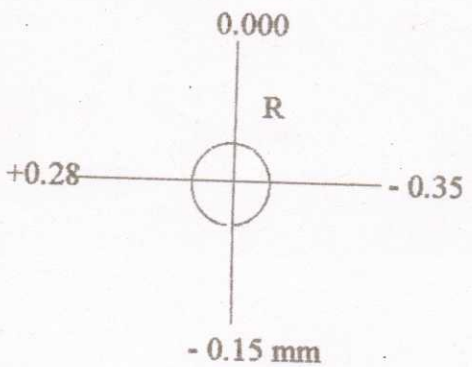
(c) Both the journal Bearings were checked and found okay.

(d) The clearances were checked & following are the readings:

Sr. No.	Description	Design Value	Actual Value(BM)	Actual Value(AM)
1	Axial Float on the pump side	10 mm	8 mm	8 mm
2	Radial bearing Clearance on the coupling end	0.20 mm	0.20 mm	0.20 mm
3	Radial bearing Clearance on the coupling end	0.20 mm	0.18 mm	0.18 mm

(e) Pump with gear box of Elliot Turbine alignment was checked Followings are the readings:

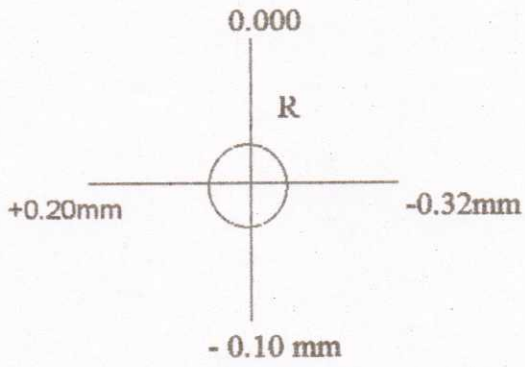
Dial on gear box Coupling



CODE NO JOB DESCRIPTION

Alignment was corrected, Followings are the readings:

Dial on gear box coupling



(f) Total Axial Float of the pump measured is 8 MM.

(g) Cleaning the coupling of pump with gear box & greasing done.

(h) New Gland packing (25 mm) both side re-packed.

(i) NRV Gland packing re-packed.

03 02 02 **COOLING WATER PUMP ELLIOT TURBINE (Q-4401/A) :**

PREVENTIVE MAINTENANCE :

(a) Coupling between the pump and the gear box was de-coupled after recording the necessary match marks.
(b) Both the journal Bearings and thrust bearing were checked and found okay.
(c) The clearances were checked & followings are the readings:

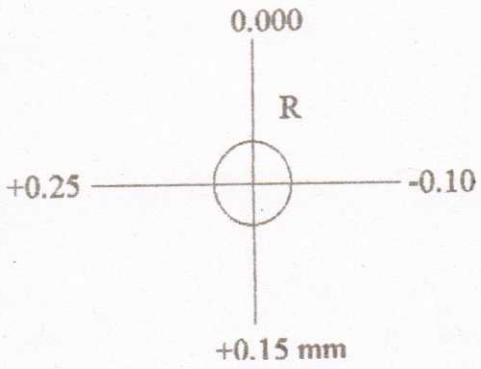
Sr. No.	Description	Design Value	Actual Value(BM)	Actual Value(AM)
1	Axial Float on the turbine		0.25 mm	0.25 mm
2	Radial bearing Clearance on the coupling end		0.18 - 0.28 mm	0.28 - 0.35 mm
3	Radial bearing Clearance on the coupling end		0.20 - 0.30 mm	0.20 - 0.30 mm

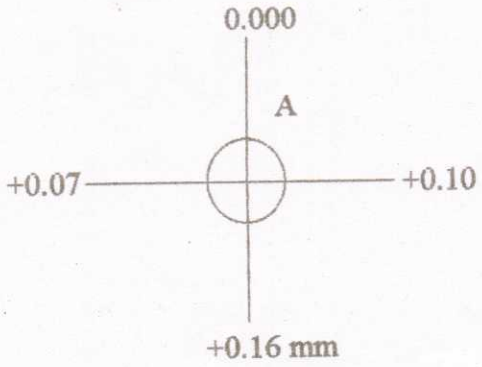
(d) Governor oil flushed and fresh oil charged.
(e) Oil console was drained, Cleaned & fresh oil charged.
(f) Governor assembly was removed, cleaned, inspected and boxed up.

CODE NO JOB DESCRIPTION

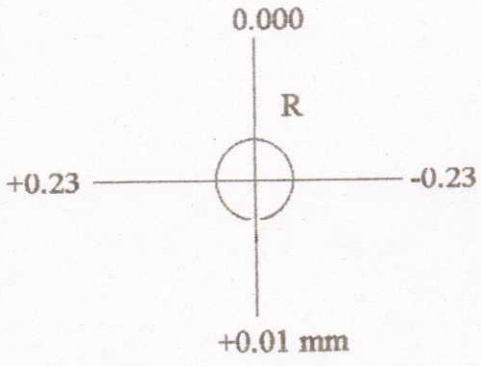
(g) Gear Box to Turbine alignment was checked

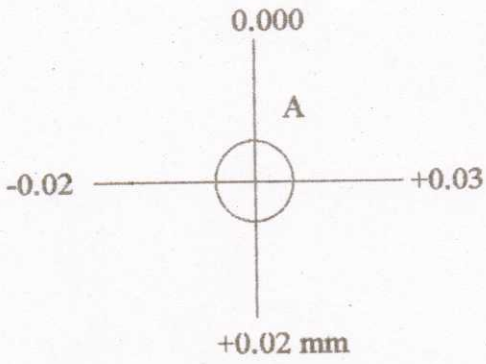
Following are the readings:





Alignment was corrected, Following are the readings:





CODE NO JOB DESCRIPTION

Elliot Turbine Gear Box :

(a) Top & side covers of gear box were removed.

(b) Bearing top halves were removed.

(c) Bearing halves were cleaned & polished using green rouge.

(d) Gears were checked and found okay.

(e) Backlash was checked and recorded.

(f) Gear box and gears were cleaned & fresh oil charged.

(g) Bearings were boxed up after taking clearances .

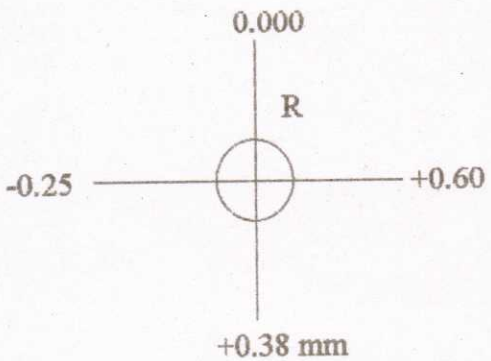
(h) Axial Float was measured and following are the readings:

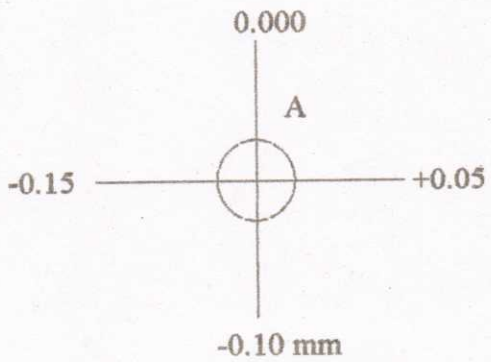
Sr. No.	Description	Design Value	Actual Value(BM)	Actual Value(AM)
1	Axial Float on the gear box pinion side	2	1.3 mm	1.45 mm
2	Axial Float on the gear box - gear side	0.5	0.4 mm	0.48 mm

(i) Pump to gear box of Elliot Turbine alignment was checked

Followings are the readings:

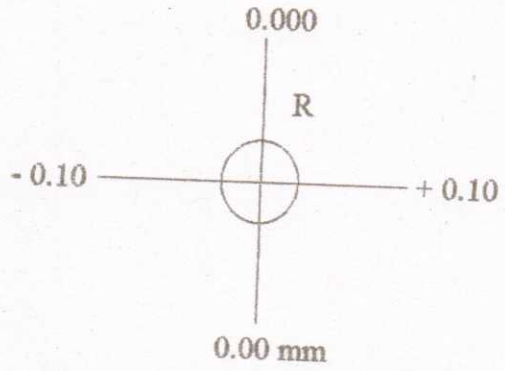
Dial on gear box Coupling :

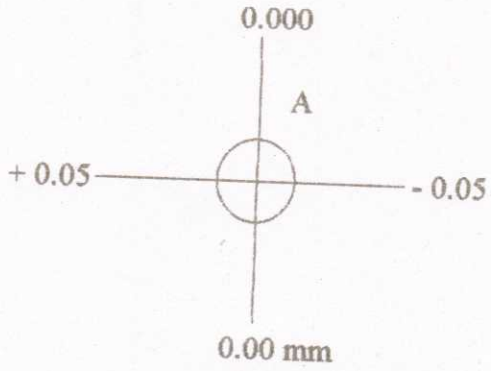




CODE NO	JOB DESCRIPTION

Alignment was corrected, Following are the readings:





03 02 03 **COOLING WATER PUMP (P-4401/B) :**

PREVENTIVE MAINTENANCE :

(a) Both the journal bearings were checked & found okay
Clearance were checked & the readings are as follows.
Free end side : 0.18 mm
Coupling side : 0.17 mm

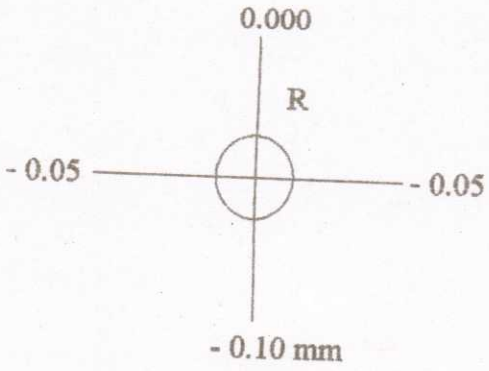
(b) De-coupled the turbine coupling , cleaned & greasing done.

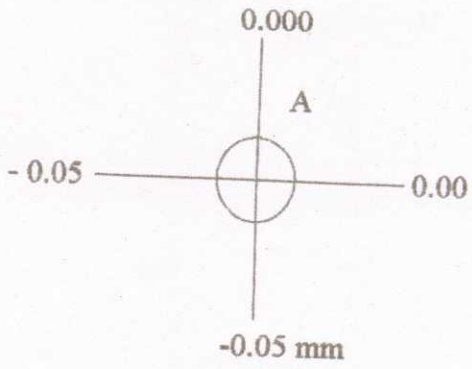
(c) Pump & Turbine Gearbox alignment was checked.

(d) New Gland packing (25 mm) both side re-packed.

(e) N.R.V. Gland packing replaced.

Alignment was checked, Followings are the readings:





CODE NO	JOB DESCRIPTION

03 02 04 **COOLING WATER PUMP (P-4402) :**

PREVENTIVE MAINTENANCE :

(a) Both the journal bearings were checked & found okay.

(b) The clearances were checked & following are the readings.
Free end side : 0.15 mm Coupling side : 0.16 mm

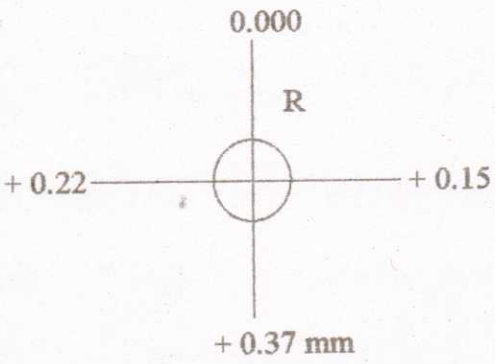
(c) Free end side new dowel pin is provided on the top bearing half.

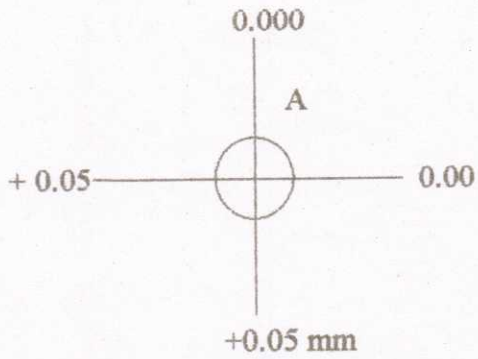
(d) Motor was de-coupled , coupling checked, new grease filled.

(e) Gland packing (25 mm) both sides re-packed.

(f) N.R.V. Gland packing is done.

(g) Pump with Motor alignment was checked and following are the readings:





03 02 05 **COOLING WATER PUMP (P-4403) :**

PREVENTIVE MAINTENANCE :

(a) Both the journal bearings were checked & found okay.

(b) The clearances were checked & following are the readings.
Free end side : 0.18 mm
Coupling side : 0.19 mm

(c) De-coupled the turbine gearbox coupling , cleaned & greasing done

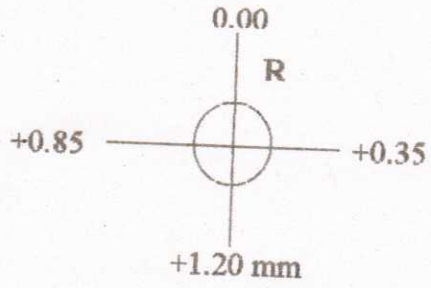
CODE NO JOB DESCRIPTION

(d) Gland packing (25 mm) both sides re-packed.

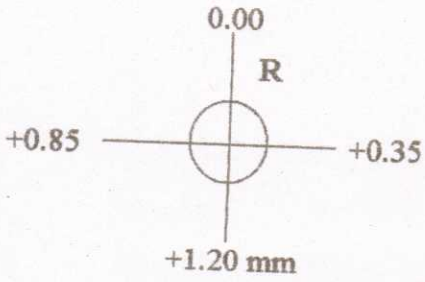
(e) N.R.V. Gland packing re-packed.

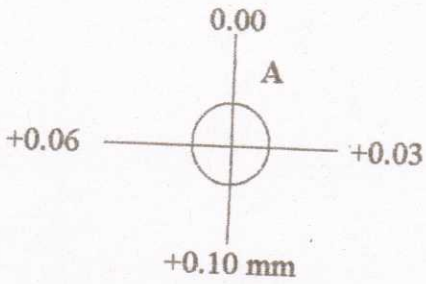
(h) Alignment was checked & followings are the readings.

Dial indicator fixed on Gearbox shaft :



Alignment was corrected, Followings are the readings:





03 02 06 COOLING WATER PUMP (P-4401/C) :

PREVENTIVE MAINTENANCE :

(a) Both the journal Bearings were checked & found okay.

(b) The clearances were checked & following are the readings.
Free end side : 0.20 mm
Coupling side : 0.20 mm

CODE NO	JOB DESCRIPTION

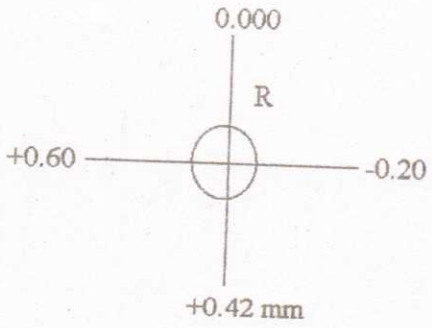
(c) Both the bearing housing were flushed with oil & fresh oil servo prime 68 charged in the both bearing housing.

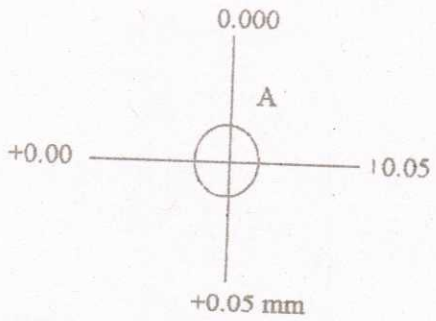
(d) De-coupled the pump coupling , cleaned & greasing done.

(e) Gland packing (25 mm) both sides re-packed.

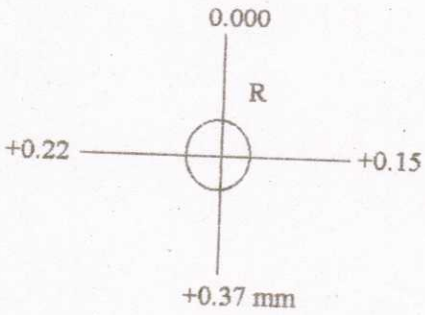
(f) N.R.V. Gland packing re-packed.

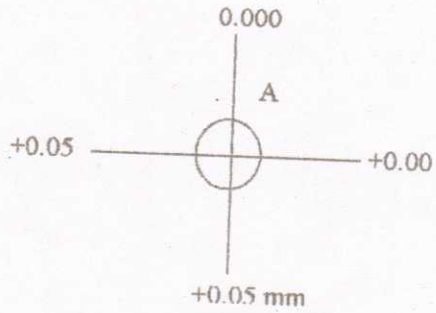
(g) Alignment was checked & followings are the readings :





Alignment was corrected, Following are the readings





CODE NO	JOB DESCRIPTION

03 02 07 COOLING WATER PUMP (P-4401 / D) :

PREVENTIVE MAINTENANCE :

(a) Both the journal bearings were checked & found okay.

(b) The clearances were checked & followings are the readings.
Free end side : 0.25 mm Coupling side : 0.17 mm

(c) De-coupled the pump coupling , cleaned & greasing done.

(d) Gland packing (25 mm) both sides re-packed.

(e) N.R.V. Gland packing re-packed.

(f) Pump & Motor alignment was checked .

03 02 08 B F W PUMP (TURBINE DRIVEN) P - 5111 :

PREVENTIVE MAINTENANCE :

P/M Jobs on this equipment was carried out as per the details given below :

(a) Removal of coupling spacer - Match marks was checked.

(b) Checking of alignment & axial play of pump shaft.

(c) Removal of DE & NDE bearings top halves.

(d) Cleaning of radial & Thrust bearings.

(e) Checking radial clearances of bearings using lead wire.

(f) Alignment readings and bearings clearances were checked.

(g) Same bearings were assembled after polishing and cleaning.

(h) Install coupling spacer with reference to match marks.

(i) Cleaning/replacing oil filters and oil in the oil console.

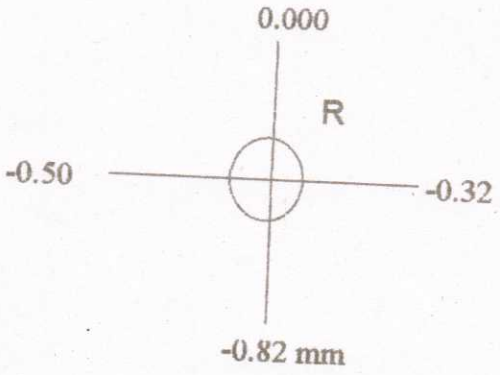
(j) Checking oil line, water line for leaks.

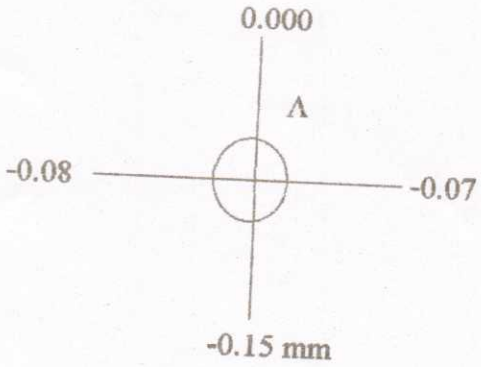
(k) Suction filter of the pump was cleaned.

CODE NO	JOB DESCRIPTION

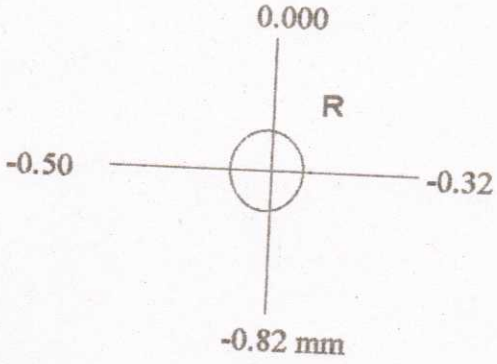
Alignment Readings: Pump To Turbine - (Before Preventive maintenance)

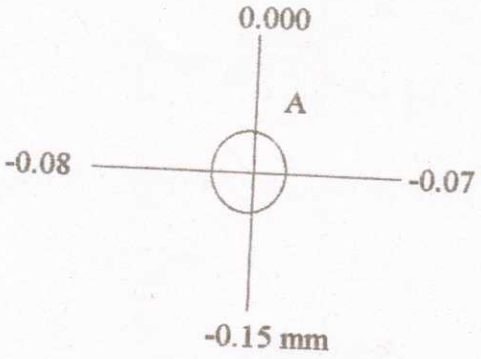
Dial on Pump Coupling :



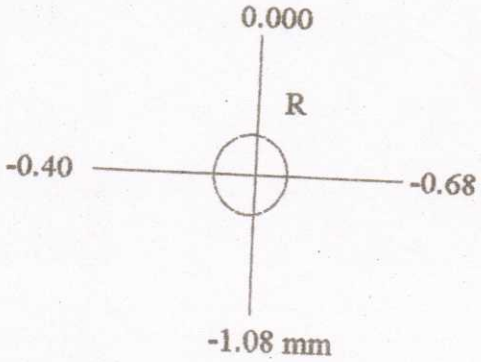


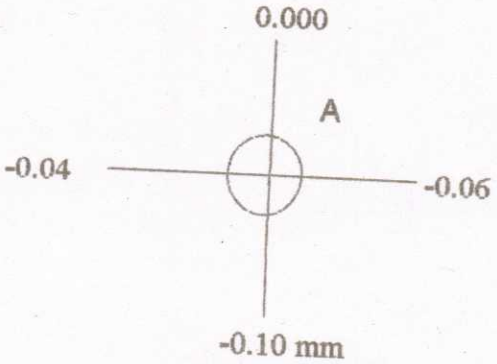
After Preventive maintenance





Original Value





CODE NO JOB DESCRIPTION

Clearance Details :

Sr. No.	Description	Design Value	Actual Value(BM)	Actual Value(AM)
1	Axial Float on the pump side	0.28 - 0.33	0.25 mm	0.25 mm
2	Radial bearing Clearance on the coupling end	0.13 - 0.18	0.12 - 0.13 mm	0.14 - 0.15 mm
3	Radial bearing Clearance on the free end	0.13 - 0.18	0.13 mm	0.13 mm

Float of Coupling : 7.0 mm

03 02 09 **B F W PUMP TURBINE (SHIN NIPPON) Q-5111 :**
OVERHAULING OF TURBINE :
JOBS CARRIED OUT:

(a) Couplings between the Pump to Turbine was de-coupled after recording the necessary match marks.

(b) Initial alignment readings and axial float were measured and recorded.

(c) Bearing top halves were removed .

(d) Coupling end and free end bearing clearances were measured using lead wire and recorded.

(d) Bearing pads were cleaned and polished using green rouge.

(e) Governor assembly was removed.

(f) Outer cover of the turbine casing is removed.

(g) Top casing of the turbine is dismantled.

(h) Internal clearances of the turbine were measured.

(i) Rotor of the turbine is removed.

(j) Rotor, Top casing and Bottom casing were cleaned.

(k) Bottom halves of the bearings were assembled, clearance checked and recorded.

(d) Rotor is installed.

(l) Carbon packing were changed after inspection .

(m) Internal clearances of the turbine were measured.

CODE NO JOB DESCRIPTION

(n) Top casing of the turbine is installed.

(o) Coupling is aligned with reference to match mark.

(p) Oil filter was removed, cleaned and re installed.

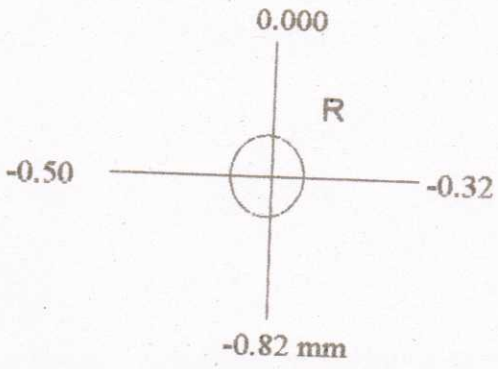
(q) Oil cooler was opened and cleaned.

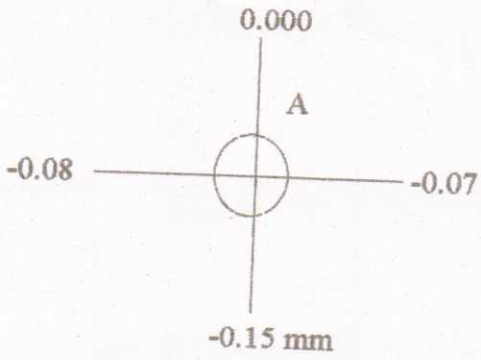
(r) Oil in the console was drained, cleaned and boxed up.

(s) Governor was cleaned, lubricated and refitted.

ALIGNMENT DATA:

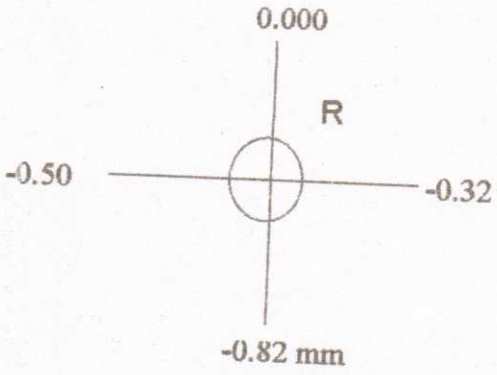
Pump to Turbine :
Before Preventive Maintenance : Dial on Coupling

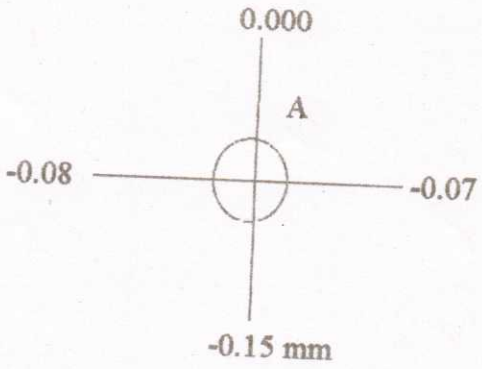




CODE NO JOB DESCRIPTION

After Preventive maintenance :





CLEARANCE DETAILS:

All the values are in mm

Sr. No.	Description	Design Value	Actual value BOH	Actual value AOH
1	Axial float on the Turbine	0.20 - 0.40	0.27	0.27
2	Radial bearing clearance on the coupling end	0.12 - 0.17	0.16	0.17
3	Radial bearing clearance on the free end	0.12 - 0.17	0.1	0.13

03 02 10 **B F W PUMP (MOTOR DRIVEN) P-5112 :**

PREVENTIVE MAINTENANCE :

PM jobs on this equipment was carried out as per the details given below :

(a) Couplings between the Pump to Gear Box was de-coupled after recording the necessary match marks.

(b) Initial alignment readings and axial float were measured and recorded.

(c) Bearing top halves were removed .

(d) Coupling end and free end bearing clearances were measured using lead wire and recorded.

(e) Bearing halves were cleaned and polished using green rouge.

CODE NO JOB DESCRIPTION

(f) Thrust collar and the bearings assembled, clearance checked and recorded.

(g) Coupling is aligned with reference to match mark.

(h) Oil filter was removed, cleaned and re installed.

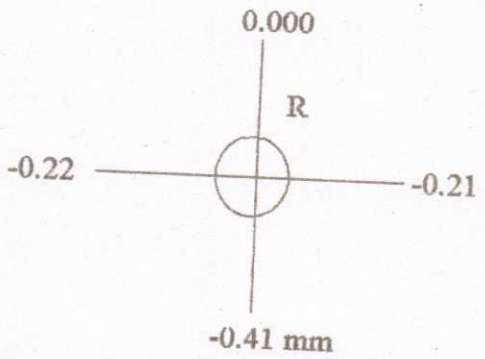
(i) Oil cooler was opened and cleaned.

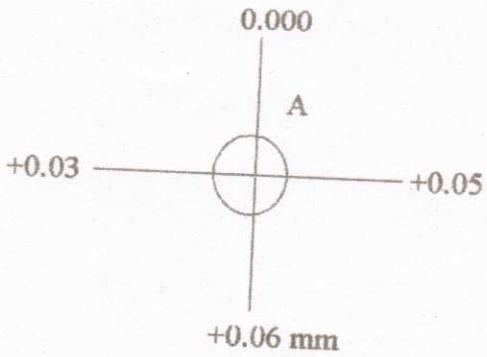
(j) Suction filter of the pump was cleaned.

ALIGNMENT DATA :

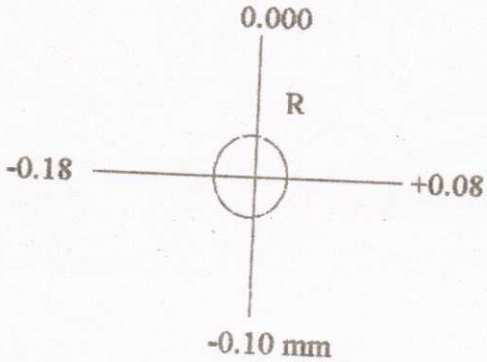
Pump to Gear Box

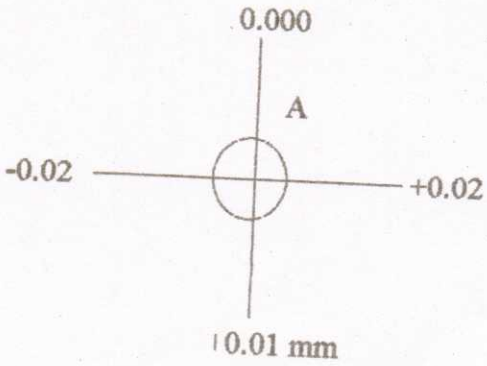
Before Preventive Maintenance : Dial on gear box :





After Preventive maintenance :





CODE NO JOB DESCRIPTION

CLEARANCE DETAILS :

All the values are in mm

Sr. No.	Description	Design Value	Actual value BPM	Actual value APM
1	Axial float on the pump side	0.28 - 0.33	0.34	0.27
2	Radial bearing clearance on the coupling end	0.12 - 0.18	0.12 - 0.13	0.12-0.13
3	Radial bearing clearance on the free end	0.12 - 0.18	0.11-0.12	0.12-0.13

PREVENTIVE MAINTENANCE OF GEAR BOX :

JOBS CARRIED OUT :

(a) Couplings between the Gear Box and Motor was de-coupled after recording the necessary match marks.

(b) Initial alignment readings and axial float were measured and recorded.

(c) Bearing top halves were removed .

(d) Coupling end and free end bearing clearances were measured using lead wire and recorded.

(e) Bearing halves were cleaned and polished using green rouge.

(f) Gears were taken out, cleaned and inspected.

(g) Gears were re installed. Backlash was checked and noted

(h) Bearings were assembled, clearance checked and recorded and boxed up..

(i) Coupling is aligned with reference to match mark.

(j) Coupling was fixed.

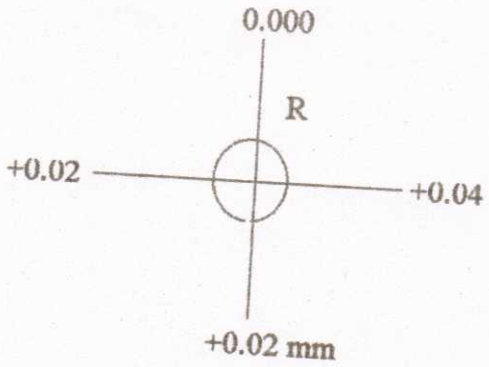
CODE NO JOB DESCRIPTION

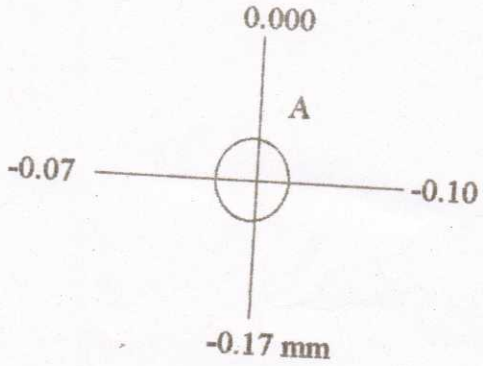
ALIGNMENT DATA :

Gear Box to Motor

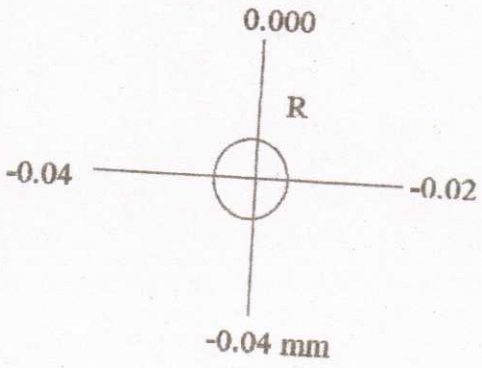
Before Preventive Maintenance:

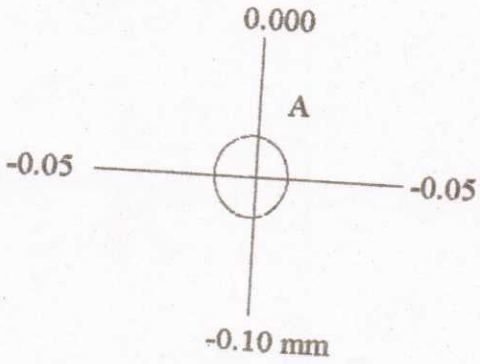
Dial on Motor :





After Preventive Maintenance : Dial on Motor :





CODE NO JOB DESCRIPTION

CLEARANCE DETAILS : (All the values are in mm)

Sr. No.	Description	Actual value APM
1	Pinion Axial float	1.28
2	Bull gear axial float	0.23
3	Backlash	0.36
4	Pinion bearing clearance	
5	Coupling end	0.13 -0.14
6	Free end	0.12-0.13
7	Bull gear bearing clearance	
8	Coupling end	0.14-0.15
9	Free end	0.13-0.14

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

PREVENTIVE MAINTENANCE :

PM jobs on this equipment was carried out as per the details given below :

(a) Couplings between the Fan to Turbine was de-coupled after recording the necessary match marks.

(b) Initial alignment readings and axial float were measured and recorded.

(c) Bearing top halves were removed .

(d) Coupling end and free end bearing clearances were measured using lead wire and recorded.

(e) Bearing halves were cleaned and polished using green rouge.

(f) Outer cover of the turbine casing is removed.

(g) Top casing of the turbine is dismantled.

(h) Internal clearances of the turbine were measured.

(i) Rotor, top casing and Bottom casing were cleaned

(j) Bottom halves of the bearings were assembled, clearance checked and recorded.

CODE NO JOB DESCRIPTION

(k) Coupling is aligned with reference to match mark.

(l) Oil filter was removed, cleaned and re installed.

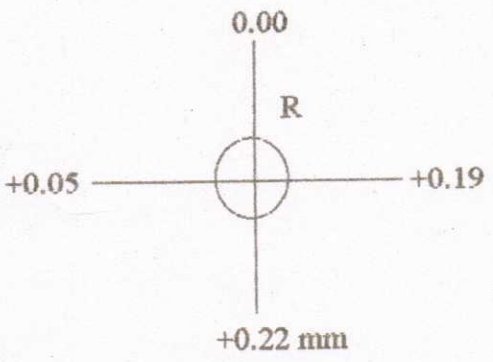
(m) Oil cooler was opened and cleaned.

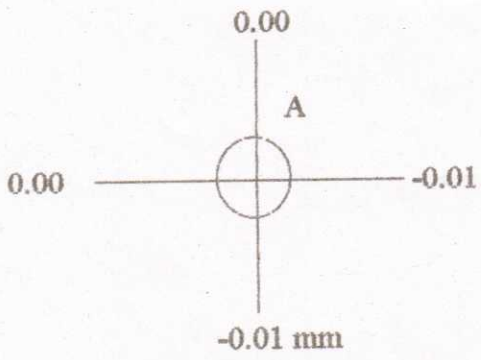
(n) Oil in the console was drained, cleaned and boxed up.

ALIGNMENT DATA:

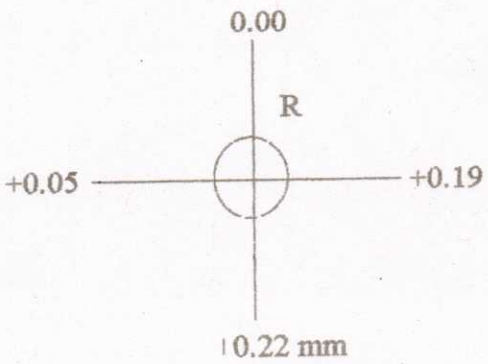
Gear box to Turbine

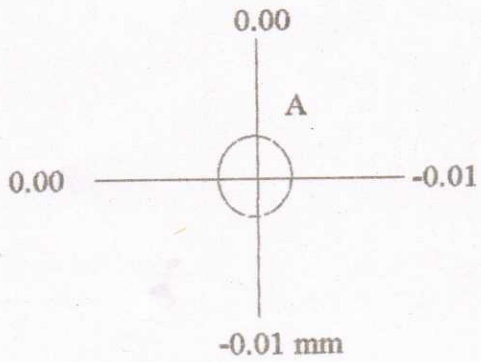
Before Preventive Maintenance :





After Preventive Maintenance:





CODE NO JOB DESCRIPTION

CLEARANCE DETAILS: (All the values are in mm)

SR. NO.	Description	Design Value	Actual value BOH	Actual value AOH
1	Axial float of the Turbine			
2	Radial bearing clearance on the low speed shaft of the gear box.	0.3	0.12 / 0.12	0.13 / 0.13
3	Radial bearing clearance on the high speed shaft of the gear box	0.3	0.15 / 0.16	0.15 / 0.16

SPARES REPLACED :

1) Pinion shaft bearings on turbine wheel side was replaced as old bearing white metal found peeled off.
2) Replaced over speed trip assembly in the turbine rotor.
3) Teflon / nylon bushes (4 nos) replaced in the oil pump.

PREVENTIVE MAINTENANCE OF THE FD FAN K5113
JOBS CARRIED OUT:

(a) Couplings between the fan to Turbine was de-coupled after recording the necessary match marks.

(b) Initial alignment readings and axial float were measured and recorded.

(c) Bearing clearances were measured using lead wire and recorded.

(d) Bearing halves were cleaned and polished using green rouge.

(e) Thrust collar and the bearings assembled, clearance checked and recorded.

(f) Coupling is aligned with reference to match mark.

(g) Cooling Water lines removed, cleaned, fixed.

(h) Bearing housing oil removed, cleaned, oil filled up to the required level.

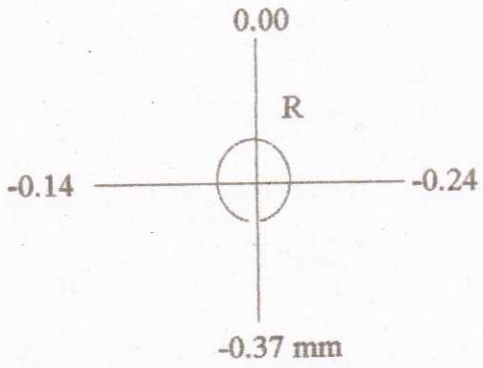
(i) CW lines removed, cleaned and assembled back

CODE NO JOB DESCRIPTION

ALIGNMENT DATA:

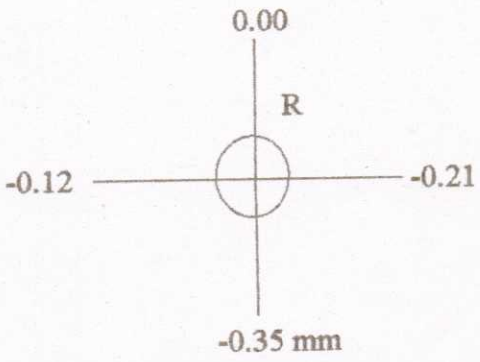
FD Fan to Gear box

Before Preventive Maintenance:
Dial on Gear Box Coupling :



After Preventive Maintenance:

Dial on Gear Box Coupling :



CODE NO JOB DESCRIPTION

CLEARANCE DETAILS : (All the values are in mm)

SR. NO.	Description	Design Value	Actual value BPM	Actual value APM
1	Float on Fan shaft	4.1	4.1	4.2
2	Float on Gear box shaft		3.2	3.2
3	Gear coupling gap between FD fan and GB		6.1	6.1
4	Gap between motor and gear box		5.44	5.5

03 14 01 STEAM LEAK JOBS :

(1) All Steam leak jobs attended as per the Shutdown job list.

(2) All the steam leak jobs as per the list were attended for cooling water pump turbines.

03 15 01 BHEL BOILER JOBS (F-5111) :

(A) BHEL BOILER RE-EXAMINATION OF PRIMARY SUPER HEATER OUTLET HEADER JOB :

M/s BHEL had conducted R.L.A study in the 2000 annual turn around. As per recommendations of RLA study report & 5 years action plan approved by IBR authority, the Primary Super Heater Outlet Header was offered for Inspection by M/S BHEL, Trichi and they have conducted RLA study of the same.

(B) BHEL BOILER INSPECTION :

(1) Boiler was inspected by Boiler Inspector in open test condition on 01.04.2002. Hydrotest at 90 Kg/cm2 pressure was done and witnessed by Boiler Inspector on 04.04.2002.

(2) All the three relief valves were overhauled & tested on 10.04.2002 and their readings were as follows.

		Popping Pr. Kg/cm2g.	Reset Pr. Kg/cm2g.
Drum Rear	R.V.	72.50	69.40
Drum Front	R.V.	68.90	65.90
Super Heater	R.V.	64.50	62.20

CODE NO JOB DESCRIPTION

(3) 4 ata F.D.Fan Exhaust Header R.V. , 14 ata Automisation line R.V. And 40 ata Soot Blower Header R.V. Were overhauled and tested at test bench.

(4) Damper of burner made free and greasing done.

(5) All remaining dampers were made free by greasing.

(6) Right Hand side Bulk stay Beam was inspected for free movement of all the fastening bolts , and all the bolts were loosened for free thermal expansion .

(C) BHEL BOILER PRIMARY SUPER HEATER COIL SEGMENT :

(1) Two nos. Of primary super header spacer coil were removed (cutout from rear wall for easy re-welding) from its position and brought down in the furnace area for replacement of damaged segment of coils

(2) After repairing both coils were fixed up at their position.

(3) One no. primary super header spacer coil on the top of the upper spacer primary super header coil was also found deformed and dislocated , hence it was also removed (cutout from rear wall for easy re-welding) from its position.

(4) After repairing the coil was fixed up at the position.

(5) All weld joints carried out on bottom floor of furnace were 100 % radiographed.

(6) All position joints (06 nos.) Were also 100 % radiographed.

(7) 03 nos. Of T-11 , 90 degree , long radius bends (issued from store) were replaced during repairing of the coils.

(8) Damaged segment were replaced with T-11 Tube procured from M/S Heavy Metals Tube, Chhatral.

(9) After repairing , departmental hydrotest followed by hydrotest witnessed by IBR authority and found satisfactory.

CODE NO JOB DESCRIPTION

(D) BHEL BOILER LONG RETRACTABLE SOOT BLOWERS (LRB'S) & ROTARY SOOT BLOWERS (RB'S) :

1) Both the LRB'S LRB-1 & LRB-2 were overhauled.

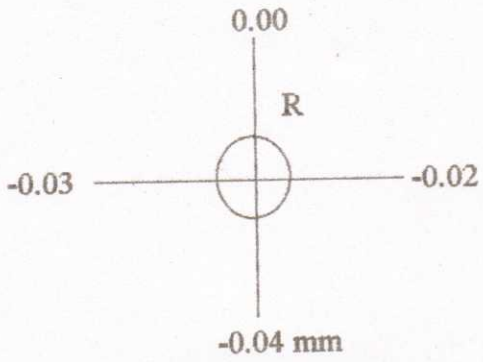
2) LRB NO. 1 was detached from casing during running of the boiler. The same was placed at its position and welded. One stopper is provided for stopping of the LRB and its total travel is reduced by 4".

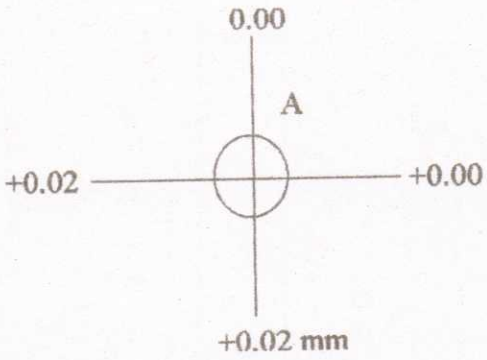
3) All the four RB'S were overhauled and boxed up.

(E) BHEL BOILER LSHS PUMP (P-5114) :

The Bornamenn make Pump was replaced with new Pump manufactured by M/S Tushako, Daman. The pump is of same capacity and pr. Rating.

ALIGNMENT DATA :





CODE NO	JOB DESCRIPTION

03 15 02 **RE -GENERATIVE AIR PRE-HEATER H-5111 :**
PREVENTIVE MAINTENANCE :

(1) General condition of Cold End baskets was found ok.

(2) General condition of Hot End Baskets was found o.k.

(3) Cold End Radial one Seal was replaced with new one, as the old seal was corroded.

(4) Radial seal clearances of Hot End side & cold end side adjusted.

(5) Both End Rotor Bearings (Spherical self aligning, withdrawal sleeve 22330 CCK / C3 / W 33) housing were open for inspection. The condition of bearings were found o.k. Boxed-up and fresh oil charged.
Bearings Clearances were checked and this is the readings :

Clearance hot end bearing : 0.025"
Clearance cold end bearing : 0.020"

(6) Steam nozzle for swivel type soot blower of RAH unit was cleaned.

(7) RAH drive Air Clutch Motor Assembly was overhauled.

(8) RAH Gear Box opened for internal inspection and found okay.

03 20 01 **FABRICATION JOBS :**

(1) F.D.Fan Duct leaky corners were welded by putting 25 x 25 x 3 mm angles.

(2) F.D.Fan casing MS corroded drain lines were replaced by SS and provided nipple with I/S valve.

(3) F.D.Fan Turbine lube oil cooler C.W. Line rerouted.

(4) RAH Hot end side C.W. collecting corrode basket was replaced with new SS one.

(5) RAH Hot end side C.W. Line rerouted for easy operation.

(6) 14 ata Thermowell point was shifted for correct temp. sensing.

(7) Steam Trap loop passing valves as per list were replaced.

(8) Urea & Ammonia side cooling water basin overflow funnels from basin were removed and overflow nozzles from outside basin were plugged.

CODE NO	JOB DESCRIPTION

(9) Q-4411, Lube oil cooling water lines were rerouted.

(10) Q-4411, Lub oil console level glass was shifted from inside to outside for clear vision.

(11) Q-4411 , Governor side bearing housing overflow line was provided (SS-304) in place of rubber hose.

(12) New C.T. Pump suction basin top corroded CS Plates were replaced with new CS plate duly epoxy painted from outside and inside.

(13) Q-5114, Lub oil console cooling coil water inlet line was choked, hence the line was replaced with new line.

(14) BHEL Boiler Mud Drum drain 2nd isolation passing valve was replaced with new valve (2" x 1500# , cs , glove valve)

(15) Primary Superheater Header corroded drain line and inoperative valves were replaced with new one.

(16) Old Urea side cooling water basin corroded CS line was replacement with SS 304, 8", SCH. 10 with gate valve.

(17) Cooling water corroded return and supply line of Q-4412, condensat transfer pump was replaced with new CS line.

(18) Cooling water corroded return and supply line of Hogging type Ejector was replaced with new SS line.

(19) 2" X 800#, Inoperative drain valve of Elliot Turbine Surface Condenser was replaced with new one.

PAINTING JOBS CARRIED OUT ON :

(1) Old CT Basin & New CT Basin underground connecting Header Inside,

(2) All The Cooling Tower Fans ,

(3) BHEL Boiler safety valves exhaust pipes,

(4) Pipe lines of BHEL Boiler area.

PLANT TURNAROUND - MARCH - APRIL - 2002

OFFSITE & UTLITY PLANT

INSPECTION JOBS

CODE NO	JOB DESCRIPTION

INSPECTION JOBS :

During March-April-2002 Shutdown, inspection of BHEL Boiler was carried out. Also, thickness measurement of Flare Stack ,cooling tower basin overflow and drain lines and steam lines was carried out.

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 99.9 MM against nominal specified thickness of 97 MM in cylindrical shell area and 78.5 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) In general, the overall condition of the mud drum was found satisfactory.

CODE NO JOB DESCRIPTION

Ultrasonic thickness measurement was carried out. Min. thickness was observed to be 82.1 MM in cylindrical shell area against nominal specified thickness of 78 MM and 55.3 MM on dished end against nominal specified thickness of 57 MM. (54 MM min. Specified).

(3) DEAERATOR :

Inspection of the de-aerator head and the storage shell was carried out. No abnormalities were observed during visual inspection. Magnetic Particle inspection of the weld joints of the storage shell was carried out. No defects were detected.

(4) FURNACE TUBES :

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, boiler side wall tubes below shield wall tubes was carried out. The detailed report indicating the thickness of individual type of the tubes is mentioned below:

SL. NO.	DESCRIPTION	MIN. THK. (MM)	DESIGN THK.(MM)	% RED.
1	SOUTH MANHOLE			
(A)	BAFFLE WALL TUBES	4.8	4.5	-
(B)	D-PANNEL TUBES	4.6	4.5	-
(C)	CUT CORNER TUBES	4.8	3.2	-
(D)	REAR WALL TUBES	4.8	4.5	-
(E)	FRONT WALL TUBES	4.7	4.5	-
2	NORTH MANHOLE			
(A)	BANK TUBES	3.5	3.6	-
(B)	BAFFLE TUBES	4.8	4.5	-
(C)	NORTH SIDE WALL TUBES	4.4	4.5	-
3	PRIMARY SUPERHEATER TUBES INSIDE FURNACE	6.3	7.1	11.26
4	SECONDARY SUPERHEATER TUBES INSIDE FURNACE	4.9	5.6	12.5

(5) Three nos.of coil segments of the primary superheater were replaced due to dislocation of the same. The joints were DP tested as well as radiographed after final welding. The defects were rectified followed by re-radiography.

(6) Performance qualification test of the welders employed by the agency M/s. Skywin erectors was carried out total two welders were qualified for butt welding of the tubes. Necessary bend test and radiography were carried out on the test pieces.

(7) In the Boiler area, thickness measurement of the following pipelines was carried out:

(a) **Boiler Flare Stack** : Thickness measurement in the approachable area was carried out. Min. Thickness was observed to be 9.9 MM.

(b) **60 ATA steam inlet line** (2 inch NB) for FD fan turbine as well as **4 ATA steam** outlet line (6 inch NB) from FD Fan turbine were checked for thickness. Min. Thickness on steam inlet line was 7.8 mm whereas on steam outlet line, min. Thickness was recorded to be 5.4 mm.

(8) The following pipelines were also inspected for thickness in the Cooling Tower area.

COOLING WATER BASIN OVERFLOW/DRAIN PIPE :

(a) Urea Cooling Tower: Heavy external corrosion was observed on the pipe as was observed during previous shutdown. Thickness on the drain pipe was found to be 4.2 mm and on the overflow pipe, it was 6.0 mm. However, pin holes were observed on the overflow pipe under thick scales. It was recommended to replace the overflow line.

(b) Ammonia side (Cell no. 1 to 6) cooling water drain pipe was in satisfactory condition with 8.6 mm thickness whereas the overflow line had severe external corrosion. Min. Thickness on the overflow line was found to be 6.0 mm. Heavy external corrosion posed difficulty in thickness measurement. It was recommended to replace the overflow line.

(c) Ammonia side (Cell no. 7,8) cooling water drain pipe was in satisfactory condition with 5.9 mm thickness whereas the overflow line had severe external corrosion. Min. Thickness on the overflow line was found to be 5.5 mm. However, pin holes were observed on the overflow pipe under thick scales. Heavy external corrosion posed difficulty in thickness measurement. It was recommended to replace the overflow line.

CODE NO JOB DESCRIPTION

(9) In Water treatment plant, inspection of the De-gasser Tower and the De-gasser Sump was carried ou The following observations were made.

DE-GASSER TOWER :

De-gasser Tower was offered for inspection from outside through top manhole only without removing the packing rings. Following inspection activities were carried out.

(i) VISUAL INSPECTION: Top plate from outside was heavily corroded. Superficial cracks were observed on the rubber lining of air vent pipe, manhole nozzle and laterals as well as shell rubber lining. Parent metal of one of the laterals was exposed due to damaged rubber lining. Manhole rubber lining was also found peeled off at scattered locations.

(ii) SPARK TESTING: Defects were observed in complete rubber lining of the manhole nozzle as well as on laterals. Defects were observed at three different locations on the air vent rubber lining.

(iii) HARDNESS MEASUREMENT: On manhole nozzle, hardness was 80 to 85 Shore A, on laterals, 80 to 95 Shore A and on air vent pipe, 80 to 85 Shore A was observed.

DE-GASSER SUMP TANK:

i) VISUAL INSPECTION: Scattered superficial cracks running in zigzag direction were observed on the rubber lining of the shell in general. Bottom floor rubber lining was found to have minor superficial cracks in comparison to shell lining. Rubber lining of the top conical roof was greenish white in colour. Resin layer was found inside the nozzles.

(ii) SPARK TESTING: No defects were observed in complete rubber lining during spark testing.

(iii) HARDNESS MEASUREMENT: 60 to 70 Shore A hardness was observed on bottom floor, shell and top conical roof petals lining.

PLANT TURNAROUND - MARCH - APRIL - 2002

OFF-SITE & UTILITY PLANT

CIVIL JOBS

CODE NO	JOB DESCRIPTION
03 51 01	CIVIL JOBS :

(A) WATER TREATMENT PLANT :

1) Repairing of acid proof brick linings in strong effluent tank no. A & B.

2) Replacement of acid proof brick lining of top of wall weak effluent sump.

3) Repairing of supports for pipeline in Water treatment plant & floor of H_2SO_4 tank near cooling tower sump side.

4) Repairing of floor by bitumastic lining for SB assembly unit and around Anion tank in water treatment plant.

5) Maintenance of strong and weak effluent channel and repairing of strong as well as weak effluent chambers in water treatment plant upto effluent tank.

(B) BOILER HOUSE :

1) Repairing of casting refractory for burners side, floor and superheated zone inside BHEL boiler.

(C) NAPHTHA HANDLING AREA :

1) Bitumastic lining around old ammonia storage tank.

PLANT TURNAROUND - MARCH - APRIL - 2002

OFFSITE & UTILITY PLANT

ELECTRICAL JOBS

CODE NO	JOB DESCRIPTION
03 61 01	**ELECTRICAL JOBS :**

A. **OFFSITE AREA :**

1. Maintenance job carried out on following transformer: TR-4A & TR 4B

   a) Inspection of primary and secondary cable boxes, end termination, checking and tightening of connection.

   b) Insulation resistance measurement of winding in primary and secondary side.

   c) Filtration of oil.
   d) Checking of marshaling box and measurement of breakdown value of oil.

2. Preventive maintenance of all the feeder compartment in MCC 3 were carried out.:

   a) Checking the tightness of outgoing terminal.
   b) Cleaning the feeder compartment.
   c) Replacement of damaged / worn out contacts, etc.

3. Testing and calibration of all the relays installed on the feeder .

4. Retermination of cables at both ends connected between Transformer LT side to MCC Section- A incoming breaker by replacement of finger grip contact with cable lug en termination.

CODE NO JOB DESCRIPTION

B UTILITY AREA :

1. Maintenance job carried out on following transformer: TR-2A, TR-2B, TR-3A, TR-8, TR-12, TR-13,& TR-14.

   a) Inspection of primary and secondary cable boxes, end termination, checking and tightening of connection.

   b) Insulation resistance measurement of winding in primary and secondary side.

   c) Filtration of oil
   d) Checking of marshaling box and measurement of breakdown value of oil.

2. Preventive maintenance of all the feeder compartment in MCC 1,2, 2A, 2F, were carried out.:

   a) Checking the tightness of outgoing terminal.
   b) Cleaning the feeder compartment.
   c) Replacement of damaged / worn out contacts, etc.

3. Testing and calibration of all the relays installed on the feeder .

4. MCC 2B/2E is shifted to new location and commissioned.

5. Retermination of cables at both ends connected between Transformer LT side to incoming breakers in MCC -1 Section- B by replacement of finger grip contact with cable lug end termination.

6. Overhauling of following motors were carried out:

   P5111/A, 5111/B, P5112/A, P5112/B, P5119, P5117, P5115/A, P5111/B, P5113, P4405/A, P4406, MP1101/A, LOP OF Q4412, P4411/A

7. Preventive maintenance jobs were carried out in 66 KV switchyard.:

   a) Cleaning of insulators of all the CT & PT units, bus bar support, lightning arrester, breakers , etc.

   b) All the moving parts of isolators were cleaned and lubricated.

   c) 11 KV VCB panels were cleaned and outgoing cable terminals were checked for its tightness or hot spot.

CODE NO	JOB DESCRIPTION

d) All the MOCB (52-B, 52 F, 52G and 52L) were overhauled and cleaned. Breaker mechanism were cleaned and checked its operation.

e) Insulation resistance of all the CT units were measured.

f) One of the CT unit (Y phase) for 52 F breaker is replaced due oil leakage.

8. All the relays installed on panels were tested and calibrated

9. On load Tap changer of TR1A. TR1B and TR1C were overhauled, and checked for proper operation. Oil of all the OLTC chambers is replaced.

229

PLANT TURNAROUND - MARCH - APRIL - 2002

OFFSITE & UTILITY PLANT

INSTRUMENTATION JOBS

CODE NO	JOB DESCRIPTION

03 71 01 BOILER PLANT :

CONTROL ROOM PANEL INSTRUMENTS :

(1) Following Receiver / Recorders were cleaned and checked the calibration. (General cleaning, Cleaning of Orifices, Flapper Nozzle, seal checking was done) PR1/PR2, PRC5, PR15,PRC 22, PIC5151, FR2,FR3/FR4, TRC4, TRC5, LRC2, LRC3, LRC 4, FRC1, FRC11/PR15,FRC22, FRC21/FR 22 .

(2) Following Set point Tx. were cleaned and checked the calibration.FR3/FR4, TRC4, TRC5, LRC3, FRC1, LRC2, PRC5, FRC11, FRC21, FRC22, PIC5151,PIC (Gas pressure controller)

(3) Following Controllers were cleaned and checked the Synchronization. (Cleaning of Orifices, Flapper Nozzle) TRC4, TRC5, LRC3, FRC1, LRC2, PRC5, PIC 22, FRC11, FRC21, PIC 5151
(PRC 5,LRC 2-- Controller was replaced with repaired one as it was not working properly.)
(PIC 5151 -- Controller was replaced with repaired one as air leakage was found from seal port.)

(4) Following Receiver switch set value were checked :

PSL2, PSL 7, LAL 3, LAH4, PSL 8, FSL 5111, PSL 6, FSL 2, FSL 11, FSL 2, PSL 4, PSL 41, TIA 6, LSL-1,LSL-2,LSL-3,PAL-4,PSL-11,PSH-12,PSL-28,,PSL-29, ,PSL-22 ,PSL-223.

(5) Following Temp. Indicator / Recorder were cleaned and checked :

TIA 6, TIA 7, TIA 14, TR 13.

(6) Air regulators behind Control Panel were cleaned , overhauled.

(7) Following Square Root Extractor 's relay, flapper - Nozzle were cleaned.

FSQ 1, 2, 3, 4, 11, 21, 22,

(8) All wiring terminals of BMS Panel & Main Control Panel were cleaned and tighten.

(9) Damper : FD Fan inlet, FD Fan outlet, Air heater in let an Air heater outlet dampers were cleaned and operation checked. Operation was found o.k.

(10) Steam Drum: EYE - IIYE Electrodes were checked. All the terminal wire lugs were replaced by new ones.

CODE NO JOB DESCRIPTION

(11) O2 Analyze Sampling system nozzle was replaced by new s.s nozzle as the old one was corroded and also cleaned sample pipe.

(12) Field Controllers: Cleaning and sychronisation of the following field controllers was carried out:

DPC-1, PIC-21, PIC-50, LRC-4, LRC-3, PIC-2..

(13) M/s Rockwin make flow indicators are mounted in boiler panel for flow indication of BFW flow

a) Steam Flow, Gas Flow, Oil Flow.

b) Notc : Indication of Stcam Flow has bccn providcd to UREA plant via multiplicr unit.

(14) TRC-4/TRC-5 : New electronic controllers are provided in boiler panel and done necessaries wiring ,tubing and other components like I/P Converter, Temp to Current converters.

03 71 02 UPSS SYSTEM :

(1) 110 V AC Power supply for Boiler Plant instruments is lined up from "Fuji" make UPS System of Ammonia and M/s IL, Kota make UPS System of Boiler plant. For this purpose following jobs has been carried out :

- Necessary cables has been laid from urea plant to Boiler control room.
- Isolator switch is mounted in Power distribution panel located in UREA DCS room (IL Panel)
- Hooked up both the system and Checked the performance of both the UPSS System.
- Checked the performance of batteries for M/s IL make UPS System by taking 10 minutes to 2 Hrs load on batteries.
- M/s Keltron make UPS System is disconnected from line.
- UPSS power of M/s Fuji and M/s IL is selected from the two way switch located in Inverter room.

CODE NO	JOB DESCRIPTION

03 71 03 FIELD JOBS :

(1) Following Flow transmitters and air regulators were cleaned and checked the calibration of Tx / Receiver gauge. FT 1(Pneumatic & Electronic Both), FT-2,FT 3, FT11, FT 13, DPT 1, DPT 14, DPT 12. Installed the following smart type electronic flow ttransmitters in parellel with existing pneumatic tx.* FT-1 (BFW Flow) , FT-2 (Steam Flow), FT-21 (Oil flow) , FT-22 (Gas flow)
Note : Glycol was filled in FT-21 impulse line

(2) Following Pressure transmitters and air regulators were cleaned and checked the calibration of Tx / Receiver gauge PT 1, PT 2,PT 4, PT 5, PT-6,PT-7,PT-21,PT-22,PT-41,PT-50,DPI-1,DPT-12.

(3) Following Level Transmitter and regulators were cleaned and checked the calibration of Tx/ Receiver gauge LT 1, LRC 2, LRC 4, LT-3 (Blow Down Level Tx), LT-5.

Note : Glycol was filled in 0LT-5 impulse line.

(4) Following pneumatic Controller (440R) & air regulator were cleaned and checked the calibration. DPC 1, TIC 2, PIC 1, PIC-2, LRC3 (Blow Down Tank level controller), Soot Blower steam pressure controller, Oil Header Pressure controller, PIC 50.

* M/s ABB make controller for 4 ata steam controller was replaced with pneumatic 440 controller as ABB controller was not working properly.

(5) Following pressure & level switch were cleaned and checked/Calibrated the set value. Day Tank IIigh/Low Level , Dearator Extra low level, low level, IIigh level, Drum level Extra low level (LSLL 1),LAL 2, LAH 3, LAH 4,PAL 5114, PLCI 5112, PLCO 5111, PAL 5115, PLCI 5114, PLCO 5113, PAL 5114, PLCI 5113, PLCI 5112, PSH 12, PAH 11,PSL 2, PSL 7,PAL 4, PSL 6, PSL 8,FSL 2,FSL 11,PSL 41,PSL 24, PSL 25, PSL 26, PSL 27 (LSL-1 (Drum Lvl Extra low) --- Replaced the micro switch assemblylement with new one.)

(6) Limit Switches :

(a) Burner no 1 & 2 main gun engagement limit switches replaced with new one.
(b) All BTV's limit switches(BTV 1-1, 1-2,1-3,BTV 2-1,2-2,2-3)were cleaned and checked it's operation.
(c) HOHTV, IGTV, CCV21,CCV22 limit switches were cleaned and checked it's operation
(d) All Manual Main Gun Oil/Atomising Valve limit switch were cleaned and checked the opcration.
(e) All Fuel Air Damper's limit switch were cleaned and checked it's operation.

CODE NO JOB DESCRIPTION

(7) Following Drum Pressure gauges were calibrated for production requirement for Boiler hydro testing.

PI-2, PI-3, PI-4, PI-5, LI-1 (Receiver Gauge)

(8) CONTROL VALVES :

Following control valves & it's positioner were cleaned and checked the stroke.

(a) FCV 1(100% BFW), BFW Bypass Valve, PCV 2, LCV 4, PCV 1, TCV 1, PCV 50,Oil Header Pr.c/v, Soot Blower Valve, Dearator overflow C/v.

(b) BTV 1-1, BTV 1-2, BTV 1-3, BTV 2-1, 2-2, 2-3, CCV 21, CCV 22, HORV, HOHTV, GHTV, IGTV.

(c) TCV-2 :New control valve M/s IL, make with positioner is installed and provide necessary tubing & feetings. (Installed by mech.(offsites)

(d) PRV-2 :

- Removed the plug and seat of control valve after removing c/v from line.
- Seat resting portion was found eroded/damaged.
- Material filling and Machining of seat resting portion was done by mech w/s.
- Installed the control valve back in line, overhauled the valve positioner and checked/adjusted the stroke length.

(e) PICV-50 :

* Removed the plug and seat of control valve after removing c/v from line.
* Control valve body and Seat resting portion was found eroded/damaged.
* Material filling and Machining of valve body/seat resting portion was done by mech w/s.
* Installed the control valve back in line , Overhauled the valve positioner, checked/adjusted the stroke length.

CODE NO JOB DESCRIPTION

(9) DAMPERS :

Following dampers overhauling and checked its operation. (Checked/overhauled limit switches, solenoids, air regulators etc.)

(a) Fuel Air Damper :
Replaced the actuator for both fuel air damper with new one. Overhauled the damper positioner, limit switches, air regulator, solenoid. Checked the performance./ Found o.k.
(b) F.D. fan inlet damper and its valve positioner.
(c) F.D. fan outlet damper.
(d) Air heater inlet damper.
(e) Air heater outlet damper.

(10) IGNITOTS :

* Both Burner's ignitor gun & spark plug cleaned and checked.
* Ignitor gas solenoid valve was overhauled and checked.
* Both gas & Oil flame scanners were cleaned and checked.

All furnace draft impulse lines were flushed with 7.0 kg/cm2 air.

(11) Following solenoid valves were cleaned and checked operation.

* BFW Turbine governor oil trip.
* FD Fan turbine governor oil trip.

(12) Furnace Temp t/c with t/w was replaced wth new one as it was found burnt.

(13) Carried out all instrument jobs as per mech. Requirement. BFW pump(Motor/Turbine driven) pressure switches, techo generator, THI & PI where removed and installed back.

Attended plant start up jobs.

* Steam header thermowell leakage attended. provided new copper gasket.
* PT-4 Steam Pr.(60 kg/cm2) Tx. impulse line leakage attended.
* Oil Burner No.1 ON indication attended.(adjusted the limit switch.)
* Raw water flow indication attended(signal tube was found leakage)

CODE NO	JOB DESCRIPTION

03 71 04 D.M. Water Plant :

(1) Control Valve :

Following control valve's positioner were cleaned and checked the stroke Anion I, II, III, IV, V (Stroke checked and cleaned the v/p)

(Note :Changed the v/p in Anion-III C/v as positioner was not working properly)

(2) Following Flow Tx. were cleaned and calibrated.
Cation I, II, III, IV, V Tx, (HP side I/V , Nipple was replaced by new one in Cation-III.) , Raw Water to DM Plant Flow.(HP side of impulse line was found choked), Cooling Tower make up flow Tx., FT-54 -Decation water flow , FT 51-NH4OH prep. water flow Tx, FT 52--Liq.NH3 flow for NH4OH Pep, B.F.W. to D.M. tank tx.(NH3 plant)., PMB - IV outlet flow.(k) SMB - IV outlet flow.

(3) Silica Analyser sample point location was shifted into new location due to Tech. Modification job (Condensate polishing unit) and done necessary tubing.

(4) Cleaned and tightened all wiring terminals behind the Control panel.

03 71 05 NH3 STORAGE :

(1) K-3001 A/B NH3 Compressor :

Following control valve and it's positioner were cleaned ,checked the c/v stroke, and painted. EMV 3001, ESDV, PCV 3008 and New Tank Flare Stack panel.

(2) PIC 3103 Local Controller were cleaned and synchronized.
(3) K-3101 NH3 Compressor Full / Half Load Pressure switch were setting value checked.
(4) All control valves & it's local controller related 3 LSHS Tank A ,B and C were overhauled and checked the operation.

(5) New level float was installed in LSHS tank -B as old float was got damaged. New Float rope and Guide rope was provided.

(6) All electrical JB , RTD JB were cleaned and tightened all wiring terminals.

(7) All SLPC indicators / controllers / recorders , Hybrid Recorders were cleaned and checked the Back up Battery.

(8) Cleaned, checked and tightened all terminals inside old panel, new panel, PLC panel.

CODE NO	JOB DESCRIPTION

03 71 06 COOLING TOWER :

(1) Following Flow/Pressure/Level Tx. were cleaned / overhauled and calibrated. Raw Water Inlet Flow Tx.(Annubar - 24 " line cleaned the flow element), C.T. Basin level Tx, Q-4401A/B Steam Flow To Turb Tx(FT 1090). Q-4403 Stea Flow to Turb , Raw Water Tank to C.T. Flow Tx., FT 1091 Condensate flow, Surface cond . Lvl Tx.

(2) Following Pressure/ Level Switch were cleaned and checked the set value. Surface cond. High, Low, High-High level switch.

(3) Q- 4411 Turb. North and south side radial vib probes , speed pick-up unit was removed & installed as per mech. requirement.

(4) Checked and tightened all wiring terminals of control panel.

03 71 07 I.G. Plant :

Attended all running jobs.

03 71 08 Weigh Bridge (Main Gate)

(1) Following jobs has been done .
(Service engineer From M/s Ashbee Systems Pvt Ltd was came to attend the job)

* Removed the platform and cleaned the whole weigh bridge.
* Cleaned the digital indicator/Computer .
* Painted the weigh bridge after scrubbing it.(inside as well as outside)
* Checked the alignment of load cell mounting assembly. It was found o.k. Overhauled the load cell mounting assembly.
* Calibrated the weigh Bridge with standard weights. (Checked the calibration upto 33 tones)

PLANT TURNAROUND - MARCH -APRIL 2002

B&MH PLANT

MECHANICAL JOBS

CODE NO	JOB DESCRIPTION

04 03 01 RECLAIM MACHINE M-2116 :

Following jobs were carried out during plant turnaround-2002.

1 Scrapper boom replaced with new scrapper chain and chain tensioning device.

2 Centering of king-post with respect to pivot centre checked.

3 Link conveyor belt replaced with 800 mm wide 4 ply cotton belt.

4 Link conveyor gear box overhauled by replacing Coupling bolts, bushes, oil-seals and oil.

5 Link conveyor carrier rollers replaced with new rollers.

6 Link conveyor return rollers replaced with new rollers.

7 Skirt rubber of link conveyor replaced with new skirt board sealing system.

8 Lower pivot assembly replaced by repaired one with new mounting plates.

9 Scrapper shaft of Gear-train replaced with new bearings and brg. Housings (Inner and outer).

10 Top structure of bucket elevator strengthened with patch plates.

11 Both chain sprockets of top bucket elevator shaft replaced with new sprockets.

12 Bucket elevator chain attended for replacement of damaged pins, circlips and chain-links.

13 Thruster oil replaced and brake shoes checked.

14 Fluid coupling oil replaced.

15 Coupling bushes of FC-16 of main gear - box replaced.

16 Swing gear box attended for replacing coupling bushes and tightening of cover bolts.

CODE NO JOB DESCRIPTION

17 Hub and lantern pinion assembly dismantled and assembled after checking the gap and shear pins.

18 All swing rack pins cleaned and greasing done.

19 Cardium compound provided in wire rope.

20 Pedestal bearings of both rear and front axle checked and greasing done.

21 Limit switch set for maximum up and down movement of scrapper arm.

22 Complete greasing of all greasing points and bearings of reclaim machine carried out.

23 Complete cleaning and painting of R/M done.

04 03 02 PREVENTIVE MAINTENANCE OF PACKER SCALES :

Following preventive maintenance jobs were carried out.

1 Packer scale no.1 attended for replacement of doors. Gate assy. and bucket assy. overhauled. All air cylinders serviced and replaced. Sack grip assembly replaced.

2 Packer scale no. 2 attended for replacement of doors, sack grip assembly alongwith air cylinders.

3 Packer scale no. 3 attended for overhauling of gate assy., bucket assy., and air cylinders. Sack grip assembly replaced alongwith air cylinders.

4 Packer scale no. 4 attended for replacement of bucket assembly. Air cylinders replaced. Coarse and fine feed gate assembly overhauled and sack-grip assembly replaced.

5 Packer scale no. 7 attended for overhauling of gate assy., bucket assy. and air cylinders. Stabiliser plate alignment checked and weight variation problem attended.

6 Packer scale no. 8 attended for replacement of complete bucket assembly. All air cylinders overhauled. Sack grip assembly replaced with air cylinders.

7 All packer scales calibrated.

8 Complete cleaning and painting done.

CODE NO	JOB DESCRIPTION

04 21 01 **PLANT TRANSFER CONVEYOR M-2110 :**

Following jobs were carried out

1 Gear Box of M-2110 conveyor serviced for replacement of oil-seals, coupling bolts, coupling rubber bushes and oil. Coupling done after proper alignment.

2 M--2111 diverter Flapper valve attended for proper sealing and easy operation. Greasing done in bearings.

3 Head pulley brush roller serviced.

4 All damaged return rollers removed, serviced for free rotation and refixed after replacement of rubber disks and sleeves.

5 All damaged and noisy carrier rollers and guide rollers replaced with new rollers.

6 All pedestal bearings of snub pulley, head pulley, tail pulley and gravity pulley checked and greasing done.

7 Complete cleaning and painting of structure done.

8 Damaged joint repaired by vulcanising.

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

Following jobs were carried out

1 Gear box replaced with new base plate and motor.

2 All noisy and damaged carrier, guide and return rollers replaced with new rollers.

3 Greasing done in all brgs. of head pulley, tail pulley, snub pulley and gravity pulley.

4 Complete cleaning and painting of conveyor structure done.

CODE NO JOB DESCRIPTION

04 21 03 RECLAIM CONVEYOR M-2117 :

Following jobs were carried out

1 Gear Box attended for cleaning, replacement of oil seals, oil, coupling bolts and bushes. Coupling done after proper alignment.

2 All damaged return rollers, carrier rollers and impact rollers replaced with new rollers.

3 Complete greasing done of all bearings of head pulley, tail pulley, snub pulley and gravity pulley.

4 Damaged structure of conveyor replaced.

04 21 04 BAGGING FEED CONVEYOR M-2121 :

Following jobs were carried out

1 Gear box attended for cleaning, alignment and coupling.

2 Diverter flapper valve of M-2121 conveyor attended for free and easy operation. Air cylinders overhauled.

3 Head pulley scrapper rubber (12 mm thk.) replaced and serviced for free operation.

4 Complete skirt rubber of conveyor replaced with new skirt board sealing system.

5 Return rollers and carrier rollers removed and replaced with new rollers.

6 Self aligning belt tracking system provided to prevent off-centre of the belt.

7 Conveyor belt damaged joints properly vulcanised by providing rubber solution.

8 Complete greasing of all pedestal bearings done.

9 Complete cleaning and painting of structure done.

240

CODE NO	JOB DESCRIPTION

04 21 05 **BAGGING HOPPER FEED CONVEYOR M - 2122 :**

Following jobs were carried out

1 Gear box of M-2122 belt conveyor attended for replacement of coupling bolts, bushes, oil-seals and oil. Complete cleaning and painting of gear box done. Coupling done after proper alignment.

2 Diverter plate of 3 and 4 hopper overhauled.

3 Skirt rubber with inner rubber sheet replaced.

4 Gear box of tripper of M2122 conveyor overhauled.

5 All damaged return rollers and carrier rollers replaced by new rollers.

6 Conveyor belt repaired.

7 Complete greasing in all bearings done.

8 Complete cleaning and painting of conveyor structure done.

04 21 06 **BELT CONVEYOR M - 2122 A/B :**

Following jobs were carried out

1 Both gear boxes overhauled.

2 *All damaged return rollers replaced with new rollers.*

3 Skirt rubber replaced.

4 Repaired damaged conveyor.

CODE NO	JOB DESCRIPTION

04 21 07 **DUST CONVEYOR :**

Following jobs were carried out

1 G.Box attended for replacement of oil, oil-seals, coupling bolts and bushes.

2 All damaged return rollers replaced after repairing.

3 All carrier rollers attended for free operation.

4 New skirt rubber with inner rubber sheet provided.

5 Complete greasing of all bearings done.

6 Complete cleaning and painting of conveyor structure done.

04 21 08 **SLAT CONVEYOR M-2124 (1 - 6) :**

Following jobs were carried out

1 All six slat conveyors attended for :

a) Damaged wooden slats replaced.

b) Gear box servicing.

c) MPG and MHT-60 bearing servicing.

d) Conveyor adjusting mechanism servicing.

2 Complete cleaning and painting of all slat conveyors completed.

224

PLANT TURNAROUND - MARCH - APRIL - 2002

B&MH PLANT

CIVIL JOBS

CODE NO	JOB DESCRIPTION

04 51 01 CIVIL JOBS :

Following jobs were carried out during plant turnaround-2002.

1. Repairing of Walk way for conveyor belt inside the Silo.
2. Epoxy painting of Transfer tower / room and other RCC structure / conveyor gantry.
3. Repairing of Hopper floor / packer scale floor with the use of monolithic plaster.
4. Epoxy painting of RCC columns, ceiling, slab, beams, and other RCC structure in Bagging plant completed.
5. Replacement of A. C. sheet roofing on truck loading area and wagon loading area of bagging plant (Only damaged sheet shall be replaced).
6. Concrete protection for outside surface of conveyour gantry from transfertower towards B & MH Plant.

243

PLANT TURNAROUND - MARCH - APRIL - 2002

B&MH PLANT

ELECTRICAL JOBS

CODE NO	JOB DESCRIPTION

04 61 01 ELECTRICAL JOBS :

1. Maintenance job carried out on following transformer: TR-5A & TR-5B

   a) Inspection of primary and secondary cable boxes, end termination, checking and tightening of connection.

   b) Insulation resistance measurement of winding in primary and secondary side.

   c) Filtration of oil

   d) Checking of marshaling box and measurement of breakdown value of oil.

2. Preventive maintenance of all the feeder compartment in MCC 4, 4A & 9 were carried out.:

   a) Checking the tightness of outgoing terminal.
   b) Cleaning the feeder compartment.
   c) Replacement of damaged /worn out contacts, etc.

3. Testing and calibration of all the relays installed on the feeder .

4. Overhauling of following motors were carried out :

   Dust Conveyor motor, M2110, M2112, M2114, M2116/1,M2116/2, M2116/3, M2116/4, M2116/5, M2117, M2121, M2122, M2122/A1, M2122/A2, M2123

5. Modification of Reclaim machine feeder. Replacement of D-type fuse fitting with NH type fuse fitting in reclaim machine feeder..

6. BMRs of vibro screen motors were replaced with higher sizes.

7. Power supply for controller for bag filling machine near packer scale were shifted to MCC 4A new.

8. Revamping of lighting system for M2112 conveyor system. All the fitting were replaced with 35 W fitting in view of energy saving . All MS junction boxes were replaced with SMC junction box.

2424

PLANT TURNAROUND - MARCH - APRIL - 2002

B&MH PLANT

INSTRUMENT JOBS

CODE NO	JOB DESCRIPTION

04 71 01 **INSTRUMENT JOBS :**

BAGGING & MH PLANT :

(1) **PACKER SCALES NO. P/S 1, 2, 3, 4, 7, & 8 :**

- All the 6 nos. Of Instrument Control Panels were shifted to new control room.
- Followings jobs has been caried out. (Manpower of M/s United Instrument Services Pvt Ltd. Were came to execute the job.

(A) Erected the cable trays with cover (300 mm and 50 mm size) on routes from Packer Scales to Main control panels , Solenoid boxes to Local control panels, local panel to Tol. Reset box for P/S NO. 1,2,3,4,7,8.

(B) Following cables has been laid down on the cable trays from all Packer Scales to Main control panels in control room.

- 12 pair cable from all local panel boxes to main control panel
- 8 Pair cable from all solenoid boxes to main control panel
- 8 Piar cable from all solenoid box to local panel box..
- 3 Tried proxy sw. Cable from local box to main control panel.
- 3 Tried proxy sw. cable from loadcell box to Proxy junction box.
- 6 Core loadcell cable from loadcell box to main control panel.
- 2 Core hand sw. Cable from sol. Box to proxy junction box.
- 2 Core power cable from power distribution box to main control panels in control room.
- 4 Tried cables from all local panel box to Tol. Reset Box.

(C) Following S.S. / PVC Tubing jobs has been carried out.

1) 1/4" S.S. Tubings from
   - solenoid valves to bulk head fittings.
   - air header in control room to all main control panels
   - air header at "COMPUTAPAK" Control room to all "COMPUTAPAK" Panels.

2) 1/2" S.S. Tubings from
   - air header to each solenoid box
   - air header to control room
   - air header to "COMPUTAPAK" Control room

CODE NO JOB DESCRIPTION

3) 6 mm PVC Tubing from
   - Bulk head fittings ton cylinders.
   - Internal Tubing in main control panel.
   - Internal PVC tubings inside "COMPUTAPAK" panels.

(D) Removed the Old M.S.. Make solenoid boxes and installed the new S.S. Make solenoid boxes.
   - Solenoid valves / lubricators etc removed from old solenoid boxes, overhauled them and mounted in new S.S. Solenoid boxes.

(E) Removed the old proxy and loadcell junction boxes and installed the new S.S. Junction boxes.
   - Done necessory wiring job.

(F) Removed the old M.S. Local control panels and installed new S.S. Local control panels.
   - Lamps, Push buttons, counters, Selector switches etc. Components were removed from old local boxes and mounted in new S.S. Local panel boxes.
   - Done internal wiring of local control panel boxes.

(G) Removed all the 6 nos. Of Instrument control panels and shifted/installed in new control room.
   - Removed the all field wiring cables(except panel internal wiring) from main panel.
   - Un installed the main panel and shifted to new control room. Fabricated the necessary mounting arangements and installed the panel in the control room.

(H) Terminated the field cables in the main panel from local panel boxes, Solenoid boxes, loadcell boxes. Done the internal wirings in main control panels as per drawings.
   - Done cable glanding, lugging, feruling, wire tracing job etc..

(I) Checked all relays, fuses, Cleaned RIC Card, DataPond and checked it's operation .
   - Replaced the all Dapapond Batteries with new one.

(J) Provided 240 VAC to 240 VAC Isolation in the incoming 240 VAC power supply in all Packer scale panels.

(K) Commissioned the all Packer Scales machines.

(L) Done the calibration of all Packer Scales..

(2) **Computpak Panels**

- All PCB's inside the computpak panels were removed and cleaned
- Calibrated the Both UBM 9A, UBM 9B.

(3) **AUTO BAG PLACERS**

(a) Cleaned/checked the all sensors of both auto bag placers.
(b) Cleaned the local panels, PLC Panels.
(c) Tighten the all wiring terminals ofv local panels, PLC Panels for both auto bag placers.

(4) **WEIGHING SCALES :**

(a) Cleaned the weighing scales , Digital Indicators
(b) Cleaned the PCB of digital indicator.
(c) Calibrated the all weighing scales.

(5) **BELT WEIGHER SYSTEM**

(a) Cleaned/Overhauled the whole syatems.
(b) Checked the healthiness of loadcell, techometer, digital indicator.
(c) Checked the load cell performance by actually putting weights and checking milli volts,the performance was found satisfactory.
(d) Cleaned/Overhauled the techo meter assembly.

(6) **Dust Extraction System.**

(a) Cleaned the Dust Extraction Panel
(b) Cleaned all field instruments(C/V, Flow Tx, Level Tx etc.) related the DES

(7) **following panels Color scraping and repainting done.**

- Packer Scale Panel of bag filling machine P/S No.1, 2, 3, 4, 7, 8
- *All Oil Lubricators inside solenoid boxes were overhauled and checked.*
- New Bagging operator panel,Computpak panels, All PLC (JRSL) Panels, Local panels.

PLANT TURNAROUND - MARCH - APRIL - 2002

B&MH PLANT

TECHNICAL DEPARTMENT JOBS

CODE NO	JOB DESCRIPTION

04 81 01 TECHNICAL DEPARTMENT JOBS :

(A) MECHANICAL JOB :

72" Pennwalt make vibrating screens replaced by 84" vibrating screen (4 nos.) along with feed/dust chute and structural modifications.

(B) ELECTRICAL JOB :

Power supply to vibrating screens given with necessary modifications in the MCC.