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MTC/REPORT/CL

I F F C O

KALOL UNIT

PLANNING SECTION  
MAINTENANCE DEPARTMENT  
REPORT NO.16/1996

R E P O R T

O N

P L A N T - T U R N A R O U N D

J U N E / J U L Y - 1 9 9 6

INDIAN FARMERS FERTILISER CO-OPERATIVE LIMITED

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## P R E F A C E

Urea plant Shutdown was planned from 13.6.96 onwards to attend the leakage observed in Autoclave liner. It was also decided to shutdown Ammonia plant to attend certain major jobs during period of 15 days estimated for repair of Autoclave.

Ammonia plant was stopped on 14th June 1996 to attend N.G.Compressor active thrust pad high temperatures, replacement of rotor of Air Compressor L.P.Case due to high vibration, replacement of rotor of condensing drive turbine of Syn.gas compressor (103-JBT), cleaning of Ammonia refrigeration coolers (127-CA/CB) and Annual inspection of all Boilers by IBR. apart from other minor preventive maintenance jobs.

N.G.Compressor thrust pads were replaced by new ones as well as Preventive Maintenance on drive turbine was also carried out. After replacing Air compressor L.P.rotor with new rotor, during commissioning due to coupling failure, the old rotor was put back and commissioned. Old rotor of back pressure turbine 103-JBT was also replaced with new one which was dimensionally corrected and balanced at operating speed at the works of M/s Turbocare Houston, U.S.A.

During C.I.B inspection, Tube Bundle of 101-CA developed leakage and the same was replaced with a Tube Bundle which was repaired thru M/s.L & T, Bombay. This Tube Bundle is having Outer tubes in 1 1/4 Cr - 1/2 Mo material and Inner tubes in seamless carbon steel (SA 179) material.

In Urea plant, after thorough inspection of Autoclave liners, the defects observed from the liner welded areas of bottom hemispherical portion were repaired by welding and grinding. Also IBR inspection of waste heat boiler No.GT-1664 was carried out. Replacement of couplings of CO2 compressor by antisludge coupling, preventive maintenance of P.B.Compressor drive turbines, replacement of 3rd stage piston of P.B.Compressor, inspection of steam condensate tank (T-1501), Urea evaporator condenser (H-1425), liquid Ammonia preheater, flash tank, I.D.Fan, Urea scrapper (M-1401), etc were carried out.Cleaning of Heat Exchangers/Coolers like H-1114, H-1123, H-1204, H-1421, H-1422, H-1424, H-1425 etc.were carried out by Hydrojetting. Replaced the damaged conveyor M-1419 (Link Conveyor) by a new one.

Eventhough Urea plant was ready after completion of maint. jobs by 4.7.96. it could not be started up due to the problems of Air Compressor L.P.case failure on 3.7.96 and I.D.Fan rotor failure on 6.7.96 in Ammonia plant.

In Offiste plant, IBR inspection of BHEL Boiler as well as Preventive Maintenance of Boiler Feed Water Pump, Cooling Water Pump's drive turbines were carried out. Also inspection and cleaning of RAH system were carried out alongwith other miscellaneous jobs in BHEL Boiler.

In Bagging plant, Preventive Maintenance of Conveyor Belts, gearboxes , return rollers, troughing rollers etc. has been carried out on conveying system Nos M-2110,2112,2121,2123 and M-2124. Also preventive maintenance of 4 nos of vibrating screens, naphtha feed pump P-3302 were also carried out alongwith other misc.maintenance jobs.

During plant start up on 6.7.96, I.D.Fan rotor journal bearing portion got damaged including the Bearings. The rotor got repaired at the works of M/s.Elecon Engg.V.V.Nagar.Anand and the I.D.Fan unit was put back to operation on 12.7.96. Ammonia plant started and Ammonia production lined up by 00.35 hrs. on 14.7.96. Subsequently urea plant was started and Urea production were lined up from 14th July at 00.15 hrs.

**ELECTRICAL JOBS :**

Preventive maintenance of transformers, feeder compartments and ACBs of Ammonia, Offsite,Urea and B&MH plant area were carried out. Also overhauling of critical motors wherever felt necessary had been carried out, apart from preventive maintenance of 66 KV, 11 KV OCBS, MOCBs and VCBS etc.

**INSTRUMENT JOBS :**

Critical control valves of Ammonia, Urea and Offsite plants were overhauled and various pressure transmitters were also calibrated. Control room instruments and field instruments were cleaned and inspected.

**JOBS DONE BY TECHNICAL DEPTT. :**

Removal of thermo-compressor, providing AG to tunnel burners, tappings for Air receiver etc. were done in Ammonia plant. In Urea plant, modification of urea dust dissolving in prill cooling system, installation of additional RV on V-1103, tapping for 4 ata RV etc. were the major jobs carried out.

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THE PLANT TURNAROUNDS AT A GLANCE

SR. NO.	YEAR	AMMONIA - PLANT				UREA - PLANT				REASON IF ANY
		PERIOD		FROM	PRODUCTION	TO	PRODUCTION	DOWNTIME		
		FROM	TO	DOWN DAYS ----	TIME HRS ---	FROM	TO	DAYS ----	HRS ---	
01	1975	06-05-75	21-05-75	16	-	06-05-75	21-05-75	16	-	Planned
02	1976	26-03-76	20-04-76	26	-	26-03-76	26-03-76	26	-	Planned
03	76-77	05-12-76	22-01-77	49	-	05-12-76	24-02-77	51	-	101-JT B/D
04	1978	21-02-78	15-03-78	23	-	21-02-78	25-03-78	31	-	101-BJ B/D
05	1979	21-05-79	30-06-79	41	-	10-05-79	01-08-79	82	-	K-1101/2, 3rd Stg. Cylinder
06	1981	12-04-81	10-05-81	29	-	08-04-81	12-05-81	35	-	101-B (Plnd) Headers
07	1984	01-01-84	25-01-84	25	-	01-01-84	25-01-84	25	-	Planned
08	1986	19-03-86	03-05-86	45	-	04-03-86	01-05-86	59	-	Reformer Revamp./HP Scrubber B/D
09	1987	12-04-87	03-05-87	21	-	12-04-87	02-05-87	20	-	Planned
10	1988	18-04-88	14-05-88	27	-	18-04-88	13-05-88	26	-	Planned
11	1990	05-02-90	05-03-90	29	688.67	31-01-90	07-03-90	35	829.0	Planned
12	1991	24-02-91	13-03-91	18	429.08	23-02-91	14-03-91	20	459.25	Planned
13	1992	03-11-92	03-12-92	30.6	734.91	03-11-92	04-12-92	31	744.75	Planned
14	1993	12-09-93	23-10-93	42	986.50	12-09-93	29-10-93	47	1120.58	Revamp-II
15	1995	14-01-95	27-01-95	14	311.34	11-01-95	26-01-95	16	352.18	Scrubber H-1203-BD
16	1996	14-06-96	13-07-96	30	712.00	13-06-96	13-07-96	30	694.25	Autoclave V-1201 Leakage

PLANT - TURNAROUND - JUNE / JULY - 1996

G E N E R A L - D E T A I L S

SR.NO.	CATEGORY	QUANTITY
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EQUIPMENTS UTILISED:

01	IFFCO :	
	55 T HM Crane	01
	15 T Coles Crane	01
	18 T Tata Crane	01
	03 T Forklift	03
	Truck	01
02	<u>IFFCO - MANPOWER :</u>	
	a) Mechanical	} Existing strength
	b) Mechanical Services	
	c) Electrical	
	d) Instrument	
	e) Trainees in various trade	

HIRED - CONTRACT MANPOWER

Sr.No.	Category	Mandays
01	Mill Wright Fitter	47
02	General Fitter	207
03	Rigger	443
04	S.S.Rigger	874
05	Fabricator	49
06	Grinder	22
07	IBR Welder	14
08	Non-IBR Welder	63
09	Carpenter	12
10	Mason	17

HIRED - IFFCO TIME OFFICE 1748

Labour unskilled 1346 Mandays

HIRED - CONTRACTOR

Labour unskilled 400 Mandays

MAIN MAINTENANCE JOBS CARRIED OUT BY OUTSIDE AGENCIES

SR. NO.	JOB	CONTRACTORS NAME	W.O.NO. & DATE
<b>(A) PLANT : AMMONIA :</b>			
01	I.D.FAN ROTOR JOB	M/S.ELECON ENGG. CO.PVT.LTD V.V.NAGAR,ANAND	00494/GBT 12.8.96
<b>(B) PLANT : UREA :</b>			
01	TESTING/REPAIRING OF RELIEF VALVES	M/S.MOORCO INDIA BARODA	FREE SERVICE WITHOUT W.O.
<b>(C) PLANT : B&amp;MH :</b>			
01	BELT VULCANIZING	M/S.J.K.RUBBER WORKS AHMEDABAD	E-7683/GBT 24.6.96
<b>(D) PLANT : INSPECTION</b>			
01	THICKNESS MEASUREMENT	M/S.INDUSTRIAL X-RAY & ALLIED RADIOGRAPHER (I) PVT.LTD.BOMBAY	E-3566/SLB/48 28.2.96
02	RADIOGRAPHY WORKS	M/S.N.D.T.SERVICES AHMEDABAD	00680/SLB 26.9.96
<b>(E) PLANT : CIVIL</b>			
01	ACID PROOF LINING IN STRONG EFFLUENT TANK NO. "B"	M/S.MADHUSUDHAN MFG. & CO.AHMEDABAD	00567/SLB 25.6.96
<b>(F) PLANT : ELECTRICAL</b>			
01	COOLING WATER TURBINE MOTOR 1350 HP	M/S.BHEL, BARODA	00576/ARV 13.8.96
<b>(G) PLANT : PLANNING</b>			
01	HOT & COLD INSULATION OF PLANTS	M/S.BALAJI INSULATION THANE	E-7770/GBT 23.7.96
02	SUPPLY OF UNSKILLED LABOUR	M/S.SAIYAD & CO.KALOL	00408/GBT 19.6.96
03	HIRING OF SKILLED MANPOWERS	M/S.GENERAL ENGG. BHARUCH	E-6674 9.3.96

MAIN MAINTENANCE JOBS CARRIED OUT BY OUTSIDE AGENCIES

SR. NO.	JOB	CONTRACTORS NAME	W.O.NO. & DATE
04	SUPPLY & APPLICATION OF ANTI CORROSIVE PAINTING	M/S.TEACON COATINGS PVT.LTD.BOMBAY	E-6673/GBT 9.9.95
05	HYDROJETTING OF VARIOUS HEAT EXCHANGERS	M/S.USHA HYDRO DYNAMICS,DELHI	E-6669 20.10.95



PLANT TURNAROUND - 1996

AMMONIA PLANT

MECHANICAL JOBS

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CODE NO	JOB DESCRIPTION
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01 01 01 ✓ AIR COMPRESSOR LP CASE 101-JLP :

Rotor of 101-JLP case was replaced with spare new rotor as existing rotor was having high vibration on pannel because of suspected unbalance.

The compressor was dismantled and following parts were replaced apart from rotor.

- I. New ring of 3rd & 4th wheel.
- II. New end seals of both the ends.
- III. New coupling hub for turbine end of the 101-JLP case rotor.

The removed LP case rotor's coupling hub at turbine end could not be removed and hence new coupling was drawn from stores. The coupling was having two hubs of different OD's (one with 5 1/4" OD and other with 6" OD). During replacement drawing of coupling was refered and accordingly 5 1/4" OD coupling hub was fitted on new LP case rotor. Drive given for coupling fitting was 0.359" and blue match was checked and found arround 100%. Also coupling hub towards the gearbox was removed from old rotor and fitted on new rotor.

Rotor was assembled with the clearances shown at the clearance sheet. Rotor was coupled with gearbox and turbine and the machine was allowed to run at minimum governor speed for blowing of air through primary reformer inlet manifolds. The machine was operated for about 5 hours.

The machine was again started on 2nd July and while putting the machine on load after running of about 10 minutes at 6800 rpm, vibration of LP case bearing and coupling side turbine bearing was observed on pannel. The turbine was manually tripped immediately and on opening of the coupling gaurd between 101-JLP and 101-JT, it was observed that the coupling hub on 101-JLP rotor has shipped off from its position.

It was decided to replace the rotor with the old one as the coupling hub area on the new rotor got damaged. The old rotor with coupling hub at turbine end which could not be removed earlier was taken to workshop for removing the same by machining.

RECOMMENDED CLEARANCES

REF.	CLEARANCE	BETWEEN
A	0.021" TO 0.027"	OIL GUARD (7,44)
C	0.013" TO 0.015"	BEARING HSG. (9)
D	0.005" TO 0.008"	BEARING PAD (10)
E	0.010" TO 0.013"	RING (11)
J	0.025" TO 0.029"	BUSHING (54)
L	0.025" TO 0.029"	BUSHING (54)
M	0.002" TO 0.004"	OIL GUARD (49)
S	0.002" TO 0.004"	OIL GUARD (49)
T	0.018" TO 0.022"	RING (14)
U	0.030" TO 0.035"	RING (19, 23, 29)

1<sup>ST</sup> OVERHAUL WITH NEW ROTOR

ACTIVE SIDE PADS AND BASE RING PUT ON INACTIVE SIDE AND INACTIVE SIDE PADS AND BASE RINGS PUT ON ACTIVE SIDE DURING OVERHAUL

AFTER BEFORE

0.004" 0.004"

0.008" —

0.004" 0.004"

0.004" 0.007"

0.011" 0.015"

0.016" 0.014"

0.007" 0.019"

0.015" 0.017"

0.010" 0.010"

0.015" 0.019"

0.012" 0.014"

0.004" 0.004"

0.005" 0.007"

0.007" —

0.010" —

TOTAL END FLOAT

0.278" 0.252"

TOTAL FLOAT WITHOUT SHOES  $5\frac{1}{16} \pm \frac{1}{32}$

COUPLING TO 101-JT

BEFORE AFTER

OIL GUARD (7)-A 0.005" 0.005"

JOURNAL BRG. C AND D CLEARANCE 0.005" TO 0.008" (9&10)

OIL GUARD (7)-A 0.005" 0.005"

RING (11)-E (N) 0.003" 0.003"

BALANCE DRUM RING (14)-T 0.007" 0.009"

WHEEL (18)

RING (19)-U (N) 0.019" 0.010"

BUSHING (80)-J (N) 0.008" 0.001"

WHEEL (22)

RING (23)-U (N) 0.017" 0.013"

BUSHING (60)-L 0.010" 0.010"

WHEEL (28)

RING (29)-U 0.035" 0.020"

BUSHING (54)-J 0.014" 0.012"

WHEEL (33)

RING (11)-E (N) 0.006" 0.003"

OIL GUARD (7)-A 0.004" 0.005"

JOURNAL BRG. C AND D CLEARANCE 0.005" TO 0.008" (9&10)

OIL GUARD (49)-M 0.010" 0.010"

THRUST BEARING END PLAY 0.011" TO 0.15" 0.024" 0.012"

OIL GUARD (49)-S

OIL GUARD (44)-A

COUPLING OF GEARBOX

DRAWING NO.	SCALE	INDIAN FARMERS FERTILISER COOP. LTD. KALOL	S.NO.	QTY.	DES.	SIZE	MATERIAL
	DRN. KAM		NAME	DATE	PLANT	EMR NO.	
	CHD.						
	APD.						
PLANT FORM NUMBER SHEET REV.	L.P. CASE JUNE-1996	RUNNING CLEARANCES OF BEARING LABYRINTH BEFORE AND AFTER OVERHAULING OF 101-J	01	DZ	07	06	7
			1	1	0		

RECOMMENDED CLEARANCES

REF.	CLEARANCE	BETWEEN
A	0.021" TO 0.027"	OIL GUARD (7,44)
C	0.013" TO 0.015"	BEARING HSG. (9)
D	0.005" TO 0.008"	BEARING PAD (10)
E	0.010" TO 0.013"	RING (11)
J	0.025" TO 0.029"	BUSHING (54)
L	0.025" TO 0.029"	BUSHING (54)
M	0.002" TO 0.004"	OIL GUARD (49)
S	0.002" TO 0.004"	OIL GUARD (49)
T	0.018" TO 0.022"	RING (14)
U	0.030" TO 0.035"	RING (19, 23, 29)

2<sup>ND</sup> OVERHAUL

	AFTER	BEFORE
WHEEL SPACINGS WITH ROTOR ON ACTIVE SIDE	0.004"	
	0.008"	
1 <sup>ST</sup> WHEEL	0.060"	0.005"
	0.140"	0.003"
2 <sup>ND</sup> WHEEL	0.192"	0.009"
	0.114"	
3 <sup>RD</sup> WHEEL	0.069"	0.012"
	0.022"	0.007"
4 <sup>TH</sup> WHEEL	0.163"	0.015"
	0.067"	0.008"
	0.012"	
	0.008"	

COUPLING TO 101-JT	BEFORE	AFTER
OIL GUARD (7)-A		0.005"
JOURNAL BRG. C AND D CLEARANCE 0.005" TO 0.008" (9,10)		
OIL GUARD (7)-A		0.004"
RING (11)-E		0.005"
BALANCE DRUM RING (14)-T		0.010"
WHEEL (18)		
RING (19)-U		0.011"
BUSHING (80)-J		0.003"
WHEEL (22)		
RING (23)-U		0.012"
BUSHING (60)-L		0.010"
WHEEL (28)		
RING (29)-U		0.020"
BUSHING (54)-J		0.012"
WHEEL (33)		
RING (11)-E		0.006"
OIL GUARD (7)-A		0.004"
JOURNAL BRG. C AND D CLEARANCE 0.005" TO 0.008" (9,10)		
OIL GUARD (49)-M		0.005"

0.005"	
0.005"	
0.007"	
0.005"	
TOTAL FLOAT (7.54 MM)	
0.004" (N)	

TOTAL FLOAT WITHOUT SHOES 5/16"	THRUST BEARING	END PLAY 0.011" TO 0.15"	CLEARANCE (0.012")
	OIL GUARD (49)-S		0.005"
	OIL GUARD (44)-A		

COUPLING OF GEARBOX

INDIAN FARMERS FERTILISER CO-OP. LTD. KALOL		S. NO.	QTY.	DES.	SIZE	MATERIAL
NAME	DATE	PLANT	EWR NO.			
DRM. KAM	1.3.96	RUNNING CLEARANCES OF BEARING LABYRINTH BEFORE AND AFTER OVERHAULING OF 101-J				
APD.		L.P. CASE JUNE-1996				
SCALE:-		PLANT FORM	NUMBER	SHEET	REV.	
DRAWING NO.		01	02	07	06	
		07	06	07	01	

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 CODE NO                      JOB DESCRIPTION  
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Simultaneously the LP case was dismantled and the old rotor was reinstalled with 6" OD coupling hub towards the turbine end. The other end was fitted with the old coupling hub removed from new rotor.

The machine was assembled again on 5.7.96 and was put back on slow roll at 17.00 hr on 5.7.96. The vibration on pannel at 6800 rpm on loaded condition were 2.1 mils for south end journal bearing and 2.6 mils for north end journal bearing. Machine was handed over to production Department.

01 01 02 ✓ AIR COMPRESSOR DRIVE TURBINE 101-JT :

Following preventive maintenance jobs were carried out.

- a) Bearings clearances checked and found okay.
- b) Thrust adjusted.
- c) Turbine front base expansion keys were removed, cleaned & put back into position.

01 01 03 ✓ AIR COMPRESSOR GEAR BOX 101-JR :

Bearings of gearbox inspected and found okey.

	L.P.side	H.P.side
	-----	-----
Pinion	0.008"	0.008"
Gear	0.008"	0.008"

Axial thrust : 0.014"

01 01 04 ✓ AIR COMPRESSOR LUBE OIL TURBINE 101-JLJT :

Following P.M.jobs were done :

- a) Governor oil was flushed.
- b) Bearings greasing were done.
- c) Coupling greasing was done.
- d) Governor Droop setting was done as the governor was hunting during start up.

01 01 05 ✓ A.G.COMPRESSOR LUBE OIL TURBIINE 102-JLJT :

Following P.M.jobs were done.

- a) Governor was replaced because the old governor was having oil leakage from oil seal of the terminal shaft.
- b) Oil from both the bearing housing was flushed.
- c) Oil leak of inboard bearing housing was attended.

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 CODE NO                      JOB DESCRIPTION  
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01 01 06 ✓ N.G. COMPRESSOR 102-J & ITS TURBINE 102-JT :

Following P.M.jobs were done :

- a) Compressor's journal bearings were checked.
- b) Turbine's journal bearings were checked.
- c) Turbine and Compressor's thrust bearings were checked.
- d) Coupling checked and found okey.
- e) ESV was opened, cleaned and boxed up.
- f) All pilot valves were opened, cleaned & boxed up.
- g) Governor oil filter was replaced.
- h) Governor oil lines & R.O.going to all pilot valves were cleaned throughly.
  
- i) Lube oil console was completely drained, cleaned and fresh oil was charged.

PART REPLACED :

- 1) Turbine's front end journal bearing.
- 2) Both journal bearings of the compressor.
- 3) Active side thrust pad of compressor.
- 4) Governing oil filter.
- 5) Antifriction bearing No.51206 for hand wheel column.
- 6) Hydraulic governor.

FINAL CLEARANCES :

N.G. COMPRESSOR 102-J :

Thrust end journal bearing        : 0.1 MM  
 Coupling end journal bearing     : 0.1 MM  
 Thrust bearing clearance         : 0.30 MM

N.G. COMPRESSOR TURBINE 102-JT :

Coupling end journal bearing     : 0.18 MM  
 Front end journal bearing         : 0.23 MM

01 01 07 SYNTHESIS GAS COMPRESSOR TRAIN 103-J :

The following P.M.jobs were done.

✓ 01) BACK PRESSURE TURBINE 103-JAT :

- a) Both the bearing clearances were checked.
- b) Thrust bearing clearance was checked.
- c) Bracket for axial displacement probe was replaced with the one fabricated from SS 304 material of 6 MM thick.

✓ 02) SYNTHESIS GAS COMPRESSOR LP CASE 103-JLP :

Axial float of the rotor was checked and found to be 0.016".

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CODE NO	JOB DESCRIPTION
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✓ 03) SYNTHESIS GAS COMPRESSOR HP CASE 103-JHP :

Axial float of the rotor was checked and found to be 0.015"

All couplings were cleaned throughly and boxed up.

01 01 08 ✓ SYN.GAS COMPRESSOR CONDENSING PRESSURE TURBINE 103-JBT

The turbine was taken for major overhauling to replace the rotor with new spare rotor duly balanced at operating speed at M/s.Delaval Trenton Works, as per the findings of M/s.Delaval representative during last overhaul in Sept.-Oct.1993.

Following jobs were carried out :

- 1) Turbine was dismantled and old rotor was removed. The rotor was having heavy corrosion /erosion specially at inlet side of 6th stage at base disc to rotor.
- 2) Heavy erosion was noticed across diaphragm joint surfaces.
- 3) New spare rotor after mounting the coupling was put on the lower casing and through checking was done.
- 4) Turbine was assembled and boxed up. Running clearances were also taken (Refer attached sheet).

Parts Replaced :

- New spare rotor
- Complete set of diaphragms
- Inactive thrust bearing
- Front end oil guard
- Labyrinth between wheel No.1 & 2, 3 & 4, 4 & 5

1st,2nd and 4th labyrinth of rear end (coupling end gland housing) and 1st labyrinth of front end gland housing.

Final bearing clearances :

North side journal bearing : 0.005"

South side journal bearing : 0.004"

OST done at : 11650 RPM

01 01 09 ✓ REFRIGERANT COMPRESSOR 105-J :

All couplings (3 nos) were cleaned and boxed up.

RECOMMENDED CLEARANCES		MIN.	MAX.		MIN.	MAX.	MAX. PERMISSIBLE END FLOAT = 0.042"
	A	0.001"	0.003"	H	0.055"	0.065"	
	B	0.005"	0.008"	J	0.115"	0.125"	TOTAL DESIGN END PLAY = 0.180"
	C	0.008"	0.014"	T	0.008"	0.012"	
	E	0.013"	0.019"				

AFTER	BEFORE	FINAL		STEAM FLOW ↓ OIL RING THRUST BRG. JOURNAL BRG. OIL GUARD NOZZLE WHEEL-1 -LABYRINTH DIAPHRAGM WHEEL-2 WHEEL-3 WHEEL-4 WHEEL-5 WHEEL-6 WHEEL-7 OIL GUARD JOURNAL BRG. COUPLING	FINAL		BEFORE	AFTER
		SHROUD	BLADE		BLADE	SHROUD		
0.008"	0.013"							
0.006"	0.006"							
0.002"	0.010"					(N)	0.008"	0.005"
0.005"	0.010"					(N)	0.008"	0.008"
0.006"	0.010"						0.010"	0.010"
0.006"	0.008"						0.008"	0.011"
0.008"	0.010"					FOR NEW ROTOR	0.010"	0.010"
0.008"	0.010"					FOR NEW ROTOR	0.010"	0.010"
		FOR NEW ROTOR	FOR NEW ROTOR					
		0.060"	0.060"			0.068"	0.068"	
0.008"	0.010"	0.080"	0.074"			0.075"	0.082"	(N) 0.008"
0.008"	0.012"	0.070"	0.066"			0.068"	0.070"	0.008"
0.004"	0.010"	0.075"	0.060"			0.060"	0.075"	(N) 0.008"
0.008"	0.008"	0.064"	0.063"			0.068"	0.064"	(N) 0.008"
0.008"	0.007"	0.081"	0.073"			0.073"	0.081"	0.010"
0.006"	0.008"	0.054"	0.120"			0.120"	0.058"	0.008"
			0.055"			0.059"	0.058"	0.005"
0.010"	0.010"							(N) 0.008"
0.010"	0.010"							0.008"
0.008"	0.008"							0.004"
0.008"	0.006"							0.006"
0.003"	0.006"							
0.006"	0.006"							

END FLOAT BEFORE : 0.192"  
 FINAL END FLOAT WITH NEW ROTOR : 0.168"  
 NOZZLE CLEARANCE WITH NEW ROTOR : 0.060"

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CODE NO	JOB DESCRIPTION
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01 02 01 ✓ N.G.COMPRESSOR LUBE OIL PUMPS 102-JL/JLA :

- a) Suction strainers of both the lube oil pumps were cleaned.
- b) 102-JLA - New line was fabricated from discharge line of Aux. oil pump to oil console to facilitate change over of turbine driven pump to motor driven pump during running.

01 02 02 ✓ SEAL OIL PUMP (MOTOR DRIVEN) 103-LJ/2 :

While changing over turbine driven seal oil pump to motor driven, Aux. seal oil pump got damaged resulting into 10 kg/cm<sup>2</sup> oil pressure in discharge of seal oil pump. Hence the pump was replaced with the spare reconditioned pump. The coupling hub of the pump removed got damaged while removing and hence the same was replaced with new one. The pump was aligned with motor and run for testing purpose and found to be delivering required pressure.

01 02 03 ✓ SEAL OIL PUMP (TURBINE DRIVEN) 103-JLJ/1 :

Mechanical seal of the pump started leaking while change over from motor driven seal oil pump. After opening, "O" ring was found damaged hence the same was replaced.

Bearing greasing of both the pumps were done.

01 02 04 ✓ LUBE OIL PUMP 103-JLJ/1 :

Bearing oil was flushed.

01 02 05 ✓ BOILER FEED WATER PUMP 104-J :

Following P.M.jobs were done :

- a) Oil console was cleaned & fresh oil charged.
- b) Seal Cooler was cleaned.
- c) Oil filters were cleaned.
- d) Discharge NRV was replaced with new spare one due to passing problem.

01 02 06 ✓ TURBINE FOR BOILER FEED WATER PUMP 104-JT(ELLIOT) :

Following jobs were done.

- a) Oil console was cleaned & fresh oil charged.
- b) Governor oil was flushed.
- c) Casing drain leakage was attended.
- d) Coupling greasing were done.



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CODE NO	JOB DESCRIPTION
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01 02 07 ✓ BOILER FEED WATER PUMP 104-JA :

Following P.M. jobs were done.

- a) Oil console was cleaned and fresh oil was charged.
- b) Seal cooler was cleaned.
- c) Oil filters were cleaned.
- d) Journal bearing clearances checked & thrust was adjusted.

Journal bearing clearance :-

Thrust end : 0.006"

Coupling end : 0.005"

01 02 08 ✓ TURBINE FOR BOILER FEED WATER PUMP 104-JAT (TERRY) :

Following P.M. jobs were done.

- a) Oil console was cleaned and fresh oil charged.
- b) Governor oil was flushed.
- c) Coupling greasing were done.
- d) Both the journal bearing clearances were checked and found to be okay. However front end journal cum thrust bearing was replaced because of high thrust bearing clearance and damaged white metal lining in bottom half of journal bearing.

Thrust bearing clearance :

Final : 0.010"

Journal bearing clearances :

Governor end : 0.007"

Coupling end : 0.0045"

01 03 01 ID FAN TRAIN 101-BJT/BJR/BJ :

Following preventive maintenance jobs were carried out.

01) ✓ TURBINE 101-BJT :

- a) Journal bearings clearance were checked & found okay.
- b) Rotor locating bearing was checked & found in good condition.
- c) Woodward governor oil was flushed.

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 CODE NO                      JOB DESCRIPTION  
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02) ~~/~~ GEARBOX 101-BJR :

Gearbox oil was changed and fresh oil was charged.

03) ~~/~~ ID FAN 101-BJ :

- a) Both the bearings clearance were checked & found okey.
- b) Thrust was 0.32 mm, which is okay.
- c) Cooling water lines of upper and bottom half of both the bearing were connected and checked with DM water at 7 Kg/cm<sup>2</sup> line pressure for any leakage and was found to be okey.
- d) Aux.lube oil pump oil seal leak was attended.
- e) Both the oil coolers were cleaned.

During start up on 4.7.96 the oil level in governor of ID fan turbine was found to be dropping very fast. Hence it was decided to replace the governor with spare one. The spare governor was brought from general stores and tested on woodward govonor test bench. The same was found okay and hence replaced.

On 5.7.96 I.D. Fan governor was found not responding to any pneumatic signal from control room. After investigation it was suspected to have air leak either from diaphragm or gasket. Hence the plant was stopped to replace the governor.

The removed governor was opened as a parallel activity and its drive shaft oil seal was replaced. The same was cleaned internally and was tested on governor test bench and was replaced. After replacing the governor the gearbox was decoupled from fan and the turbine was run on solo to check the governor at various signals. Following was observed on testing.

Air pressure	R.P.M
-----	-----
15 PSI	1650
12 PSI	2300
9 PSI	3020
6 PSI	3800
4.5 PSI	4260(Overspeed trip)

The overspeed trip of the turbine occured at 4.5 PSI air signal. However it was decided to run the plant after coupling with fan with due care to avoid overspeed trip of the machine.

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CODE NO	JOB DESCRIPTION
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→ On 6.7.96 at around 6.20 AM smoke was found coming from outboard journal bearing of I.D.Fan. The plant was stopped immediately and the bearing was opened for inspection. During stoppage of I.D.Fan the oil was continuously charged with hand pump into outboard bearing. On opening of the bearing following was observed .

- 1) The white metal lining of both upper and lower half of bearing housing was completely peeled off.
- 2) The journal area of I.D.Fan rotor was found damaged having around 3MM deep wear.
- 3) The connection of cooling water lines were okay & no leakage was found from there.
- 4) The cooling water was found coming into the bearing housing from cracks developed in the bottom housing of the bearing.

It was decided to get the I.D.Fan rotor repaired at damaged journal area and hence decoupling and dismantling activity for the I.D.Fan rotor removal were started at around 10.00 AM 6.7.96.

Parallel action was taken to locate the parties for repairs of I.D.Fan rotor. Following parties were contacted.

- I. M/s.T.L.T.Engineering,Chhatral
- II. M/s.Elecon Engineering, V.V.Nagar,Anand.

M/s.TLT Engineering was not having facility to mount the rotor with 92" dia fan and length 20'- 6 3/4" of rotor. It was also not possible to dismantle the fan from rotor and remove the shaft for repairing purpose. Hence it was decided to do the repair job at M/s.Elecon Engineering which had the capacity to machine the I.D.Fan rotor without dismantling and also had carried out similar kind of job on old I.D.Fan rotor in 1978.

- The bolts were opened and the cover was removed.
- Both the bearing were opened.
- The fan was decoupled from gearbox.
- Bolts of both the suction cone were removed.
- Both end seal covers of the fan were removed.
- The rotor assembly alongwith the suction cone and seal cover was taken out at around 10 PM on 6.7.96.

CODE NO	JOB DESCRIPTION
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- The coupling was removed from the rotor and the rotor was despatched at around 6.00 AM on 7.7.96 for repair.
- Rotor was received at M/s.Elecon Engineering at 2.00 PM. on 07.07.96.
- The rotor was received at site duly repaired at around 00.00 hrs on 11.7.96.

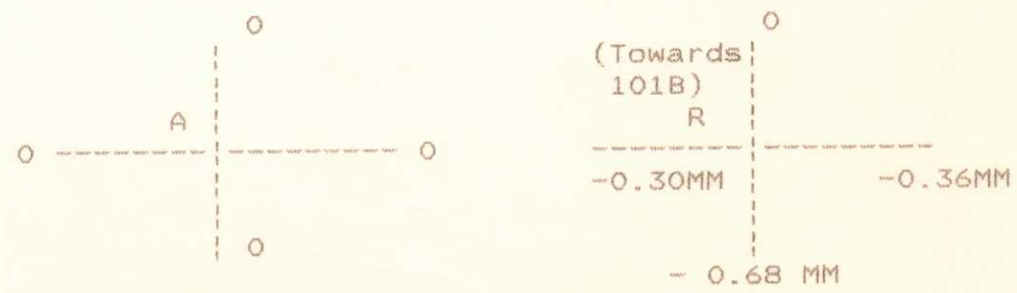
REPAIR JOB AT M/S.ELECON ENGG.V.V.NAGAR,ANAND :

The rotor shaft journal portion (outboard bearing side) was machined off to clear the damaged surfaces to a maximum extend of 4 MM on diameter. Then the shaft parent metal was inspected by D.P.Checking and found oaky.

The shaft was rebuilt to the required size through welding using L & T's Electrode - Eutectroid - 670 of 3.15 MM size. After built up, the same was machined to the actual size + 7 thou before grinding. After grinding to the final size of 7.000 inch, the shaft was subjected to D.P.test and it was found okay. Finally Rotor was despatched to Kalol site.

- The same was fitted back into position.
- Outboard end journal bearing was replaced with old usable journal bearing of good condition.
- Inboard end thrust cum journal bearing was retained as the condition of same was found to be Okay.
- The blue match of both the journal bearings were checked and journal bearing clearance were also checked.
- Both the bearings were boxed up and machine was aligned and coupled with the gearbox.

Alignment Readings :



Dial (indicator stylus) on G.B

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CODE NO	JOB DESCRIPTION
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Journal Bearing clearances :-

Inboard end : 0.012"  
Outboard end : 0.009"

Thrust bearing clearance : 0.033"

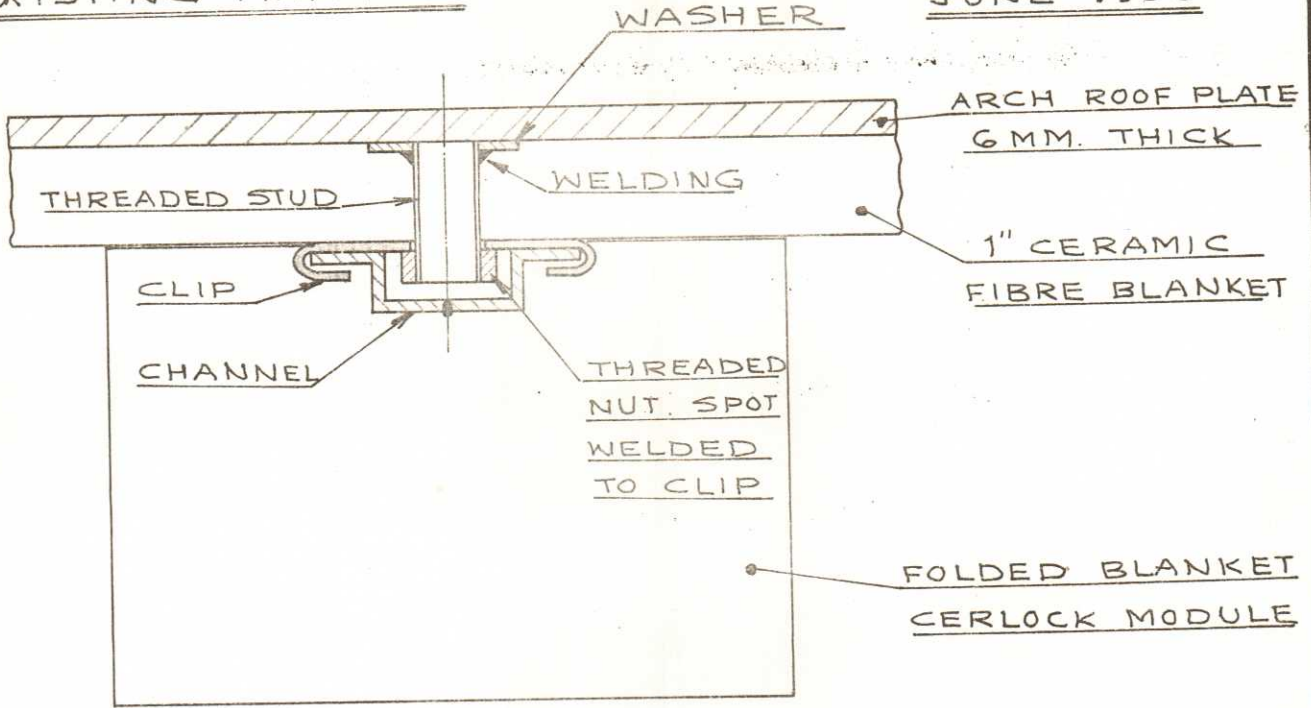
The machine was handed over for checking balancing at 8.0 AM on 13.7.96. After checking balancing at around 11.00 AM at 600 rpm. the machine was handed over to production and the Aux.boiler burner was light-up at 12.30 hrs. on 13.7.96

01 12 01 ✓ PRIMARY REFORMER 101-B PENT HOUSE JOBS :

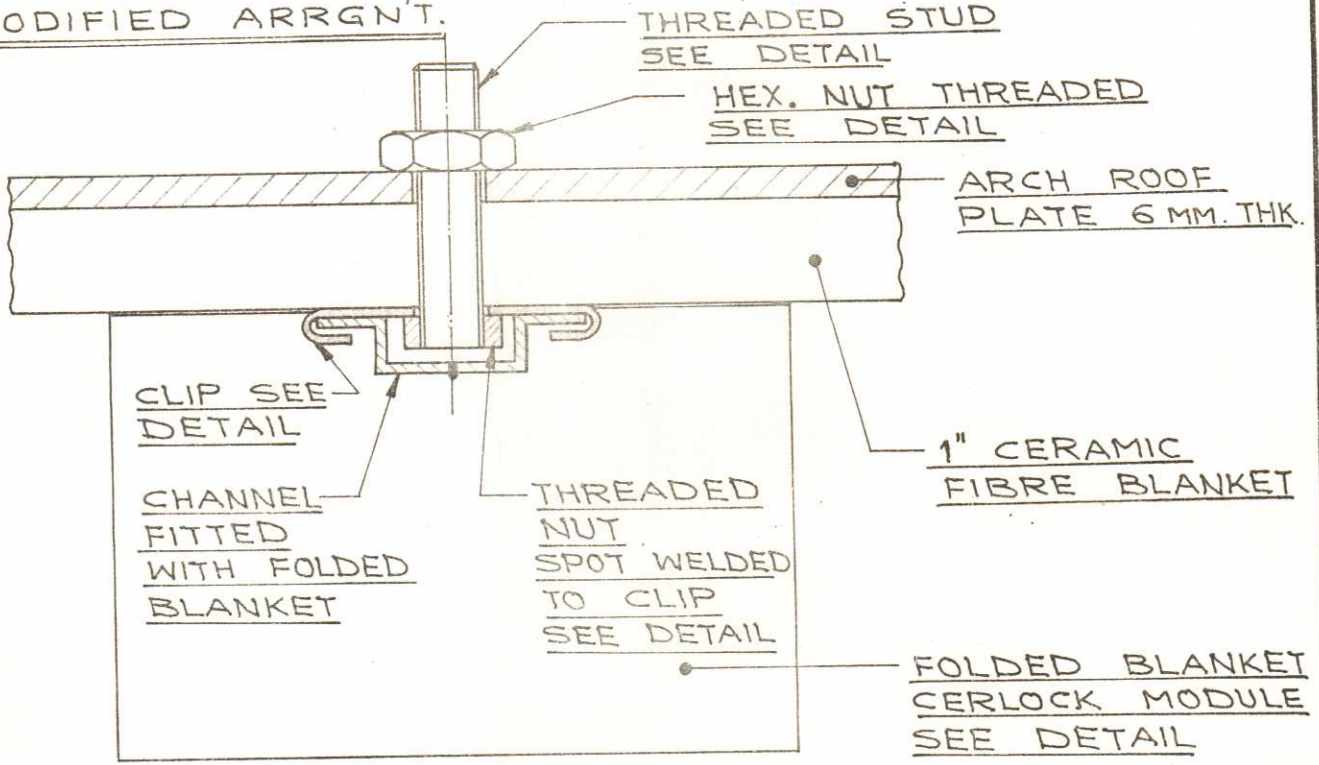
- 01) Following both Naphtha needle valves were replaced.  
311,404,405,410,713,810,811,812
- 02) Vapour Naphtha burner No.503 valve was replaced.
- 03) Drain valve of size 3/4" dia 800 # with threaded nipple and cap plug was provided on each row of Naphtha header except row No.5 at north end.
- 04) MICV-29 u/s drain valve was replaced (3/4" dia 800#)
- 05) Purging steam valve 404 was replaced (1/2" diia 800#)
- 06) Following steam line union were replaced.  
211,408,410,607,608,804,805,902,908 (9 Nos)
- 07) Naphtha line union of burner No.209 was replaced.
- 08) PRC-2 tapping root isolation valve gland was repacked.
- 09) Naphtha strainer D/S isolation valve gland was repacked.
- 10) Gas outlet sample line 1st valve replaced (3/4" dia 800 # Globe valve)
- 11) Drain valves were provided on 1st row gas inlet header at north end (3/4" dia 1500 #)
- 12) New plates were provided to Burner No.512/513,607/608 and 908/909.
- 13) Repair of damaged arch plates were done as per production department list.

FIGURE : 1  
JUNE - 1996

EXISTING ARRGN'T.




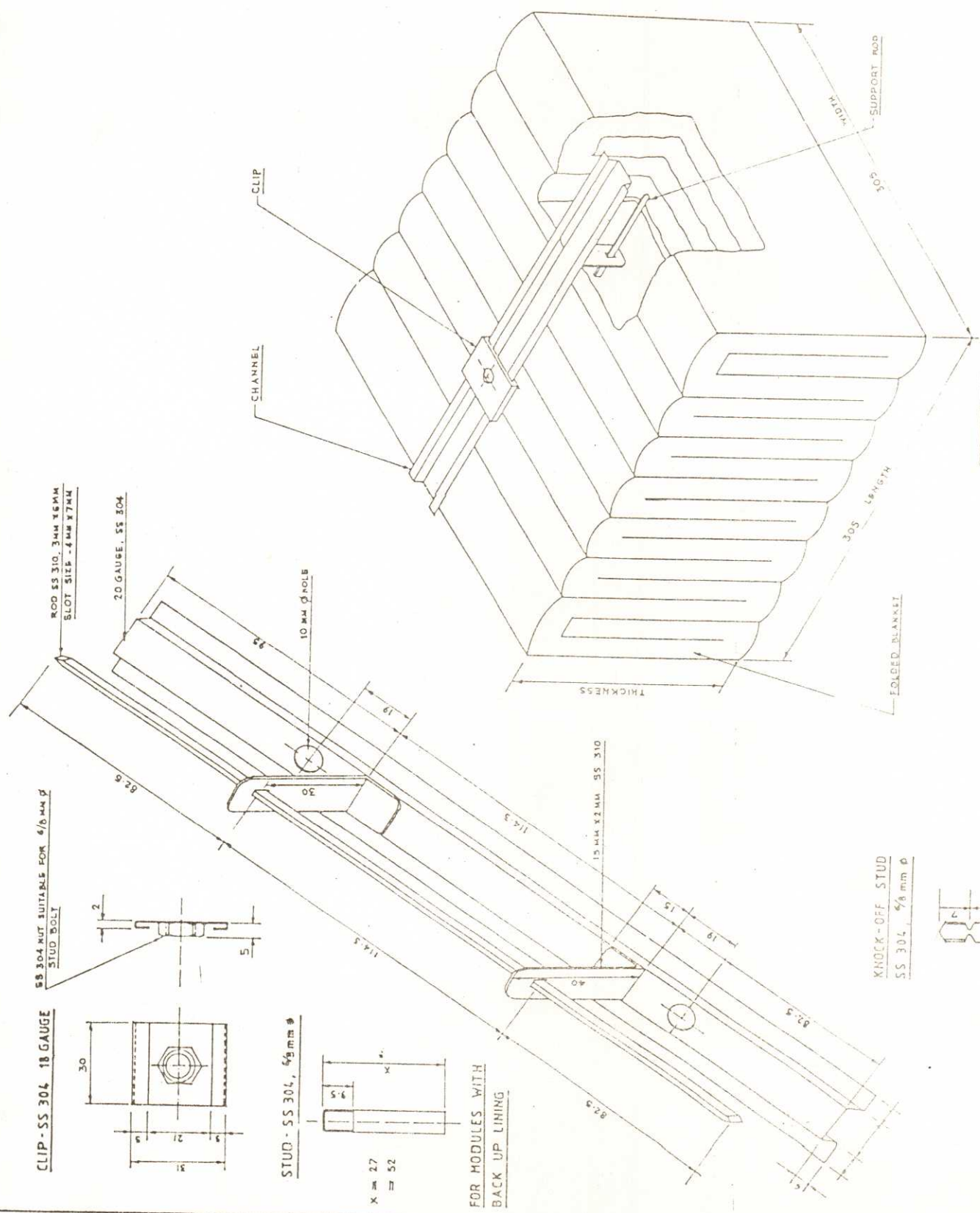
MODIFIED ARRGN'T.



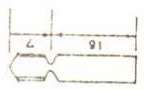
NOTE: FOR DETAILS REFER DRG. NO. OCL/101  
OF M/S. ORIENT CERWOOL LTD. BOMBAY.

BURNER BLOCK (CERLOCK MODULE & ANCHOR)  
FOR PRIMARY REFORMER 101-B

	
<b>ORIENT CERWOOD LIMITED BOMBAY</b>	
TITLE CERLOCK MODULE AND ANCHOR	
SCALE : N.T.S.	
DRG. NO. : OCL / 101	



FOR MODULES WITHOUT  
BACKUP LINING

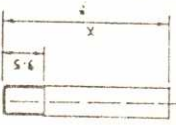
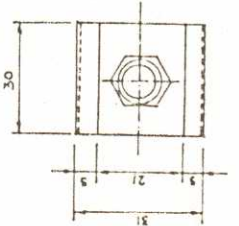
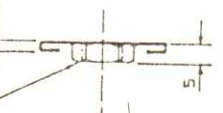


KNOCK-OFF STUD  
SS 304, 9/8 mm  $\phi$

STUD - SS 304, 5/8 mm  $\phi$

CLIP - SS 304, 18 GAUGE

SS 304 NUT SUITABLE FOR 6/8 mm  $\phi$   
STUD BOLT



FOR MODULES WITH  
BACK UP LINING

X = 27  
= 52

-----  
 CODE NO                      JOB DESCRIPTION  
 -----

- 14) Replacement of burner blocks were done as under.  
 Total 9 Nos (Refer FIGURE : 1)

Row No.	Burner Blocks Nos	Qty.(Nos)
1	102 & 107	02
5	513	01
6	607	01
7	709	01
9	902,904,906 & 909	04

01 12 02 ✓ PRIMARY REFORMER 101B RADIANT & CONVECTION ZONE JOBS :

- 01) Roof insulation inspection and repair of damaged portions were done at the following location.

Row No.	Location
1	From tube No.138 to 142
2	From tube No.201 to 211
5	Between Burner block No.508 & 509 & 512 & 513
6	Near Br.No.606,608,609,610,611,612 613 and 614
7	From tube No.732 to 737
8	Near Tube No.819 & 820

- 02) Header insulation inspection and repair of damaged portions were done.
- 03) 48 Nos Damaged tunnel slabs were also replaced.
- 04) Radiography of following tubes were done.  
 138,139,140,210,211,732,733,836 & 838 (9 Nos)
- 05) Scanning of following tubes were done.  
 138,139,140,141,142,206,207,208,209,210,211,732,733,  
 734,735,736,737,838,839,840,841,842 (22 Nos)

01 13 01 HEAT EXCHANGER JOBS :

01) ✓ REFRIGERANT CONDENSER 127-CA/CB :

- a) End covers of these heat exchanger were opened and severe chocking of strainer as well as tubes were observed from C.W.inlet side.



CODE NO	JOB DESCRIPTION
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- b) The debris were removed followed by hydrojet cleaning.
- c) Hydrottest of these exchanger were done at 23 Kg/cm2 and found ok.
- d) C.W.outlet side cover boxed up with new gasket
- e) Water flushing were done and strainers were put in their position.
- f) Exchangers were boxed up with new gasket.

✓ 02) REFRIGERANT COMPRESSOR INTERCOOLER 128-C :

- a) C.W.side end cover was opened and severe chocking of tubes were observed.
- b) Cleaning of tubes was done by rod pocking.
- c) Exchanger was boxed up with new gasket.

03) Following Coolers were cleaned by hydrojetting.  
 L.O.Coolers : 101-J (3 Nos) , 103-J (2 Nos)  
 Inter after cooler : 101-JCA (2 Nos), 101-JCB (1 No)

04) The following L.O.cooler were opened for cleaning by rod pocking and water flushing and then boxed up.  
 104-J (5 Nos), 107-J (2 Nos), 101-BJ (3 Nos)

05) C.W.line inlet strainers for 104-J, 104-JA, 107-J, 107-JA, 101-BJ were cleaned.

01 14 01 STEAM LEAK JOBS :

Various critical steam leak jobs were also attended as per production department list.

01 15 01 WASTE HEAT BOILER 101-CA :

On 20th June,1996, while Hydrotesting of steam drum, water was found coming from the drain line of 101-CA which was indicating tube leak in the tube bundle of 101-CA. Latter it was decided to take out the tube bundle for replacing with a spare tube bundle.

The material of outer tubes of this repaired tube bundle 1 1/4 Cr - 1/2 Mo as per ASTM having improved material from Cr-1/ 2 Mo to ASTM A-213 T11. It was also hydrottested at M/s.L & T after retubing against our W.O.No.E-4555 dated 03.01.94.

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CODE NO	JOB DESCRIPTION
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Opening of bolts and studs of the following joints was started from 20th evening.

- a) Steam drum (101-F) down comer & risers (2 Nos)
- b) Steam side channel flange
- c) Gas side channel flange

The bundle was removed on 23rd evening.

After removal of bundle, inside of gas shell was inspected and the following damages were observed. (Refer FIGURE : 1)

- a) Vertical Gap of about 3" found between liners No.4th & 5th from top, which was exposing the refractory.
- b) Bulging of liner found in the area adjoining liners 5th & 6th and below it.
- c) Distributor found buldged and opened about 6" length
- d) Welding of bottom liner found cracked.
- e) Bottom liner found buldged
- f) Drain liner patch-plate found detached
- g) Cracks were found in bottom liners
- h) Welding of drain liner to shell found completely cracked.
- i) Distributer end plate found buldged and touching the shell liner.

Repairing job of the shell liners started from 24th morning and completed on 1st July. The following jobs were carried out.

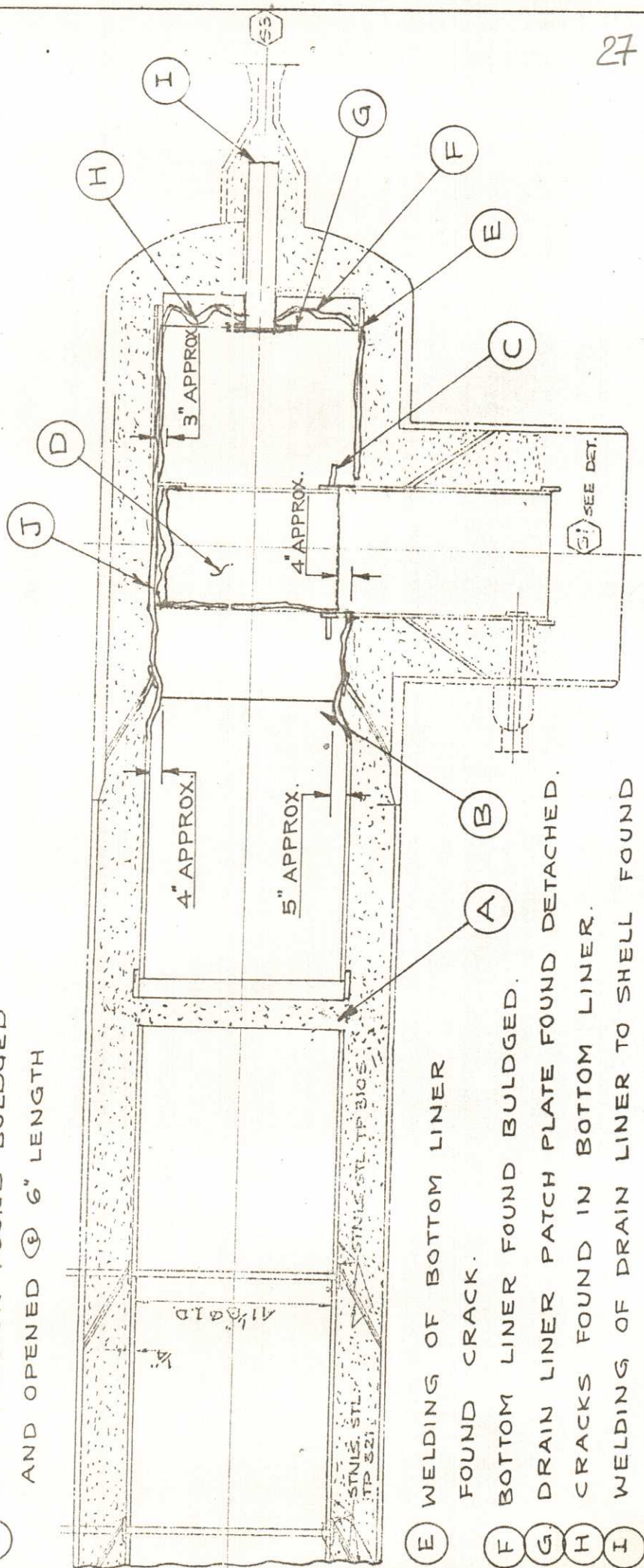
- 1) Placing the drain line to its position by hammering and then placing the sleeve on it. (Refer FIGURE : 1, 2 and 3)
- 2) Grinding of the cracks in bottom liner and welding it.
- 3) Cutting the 5th liner at the buldged portion along its periphery and shift it at its original position. (Refer FIGURE : 2 & 3)
- 4) New refractory is provided completely in the new liner area (Refractory material : Plibrico Plicast - 606)

DAMAGES FOUND IN SHELL LINER OF 101-CA

FIGURE:1

JUNE - 1996

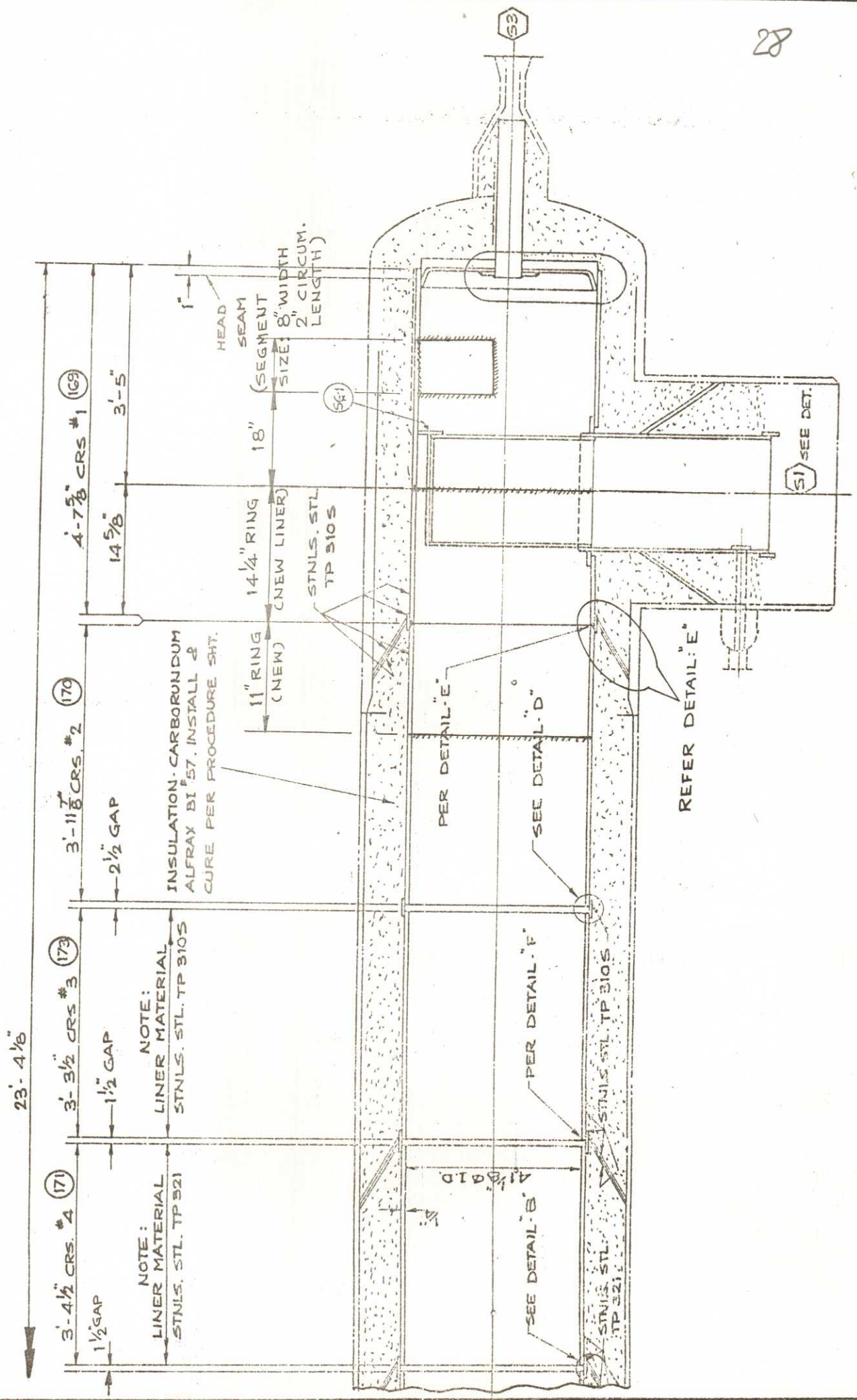
- (A) GAP OF ABOUT 3" FOUND BET'N. TWO LINERS EXPOSING THE REFRACTORY.
- (B) BULGING OF LINER FOUND IN THIS AREA.
- (C) PATCH PLATE FOUND DETACHED FROM LINER.
- (D) DISTRIBUTOR FOUND BULGED AND OPENED @ 6" LENGTH



- (E) WELDING OF BOTTOM LINER FOUND CRACK.
- (F) BOTTOM LINER FOUND BULGED.
- (G) DRAIN LINER PATCH PLATE FOUND DETACHED.
- (H) CRACKS FOUND IN BOTTOM LINER.
- (I) WELDING OF DRAIN LINER TO SHELL FOUND COMPLETELY CRACKED.
- (J) DISTRIBUTOR END PLATE FOUND BULGED & TOUCHING THE SHELL LINER.

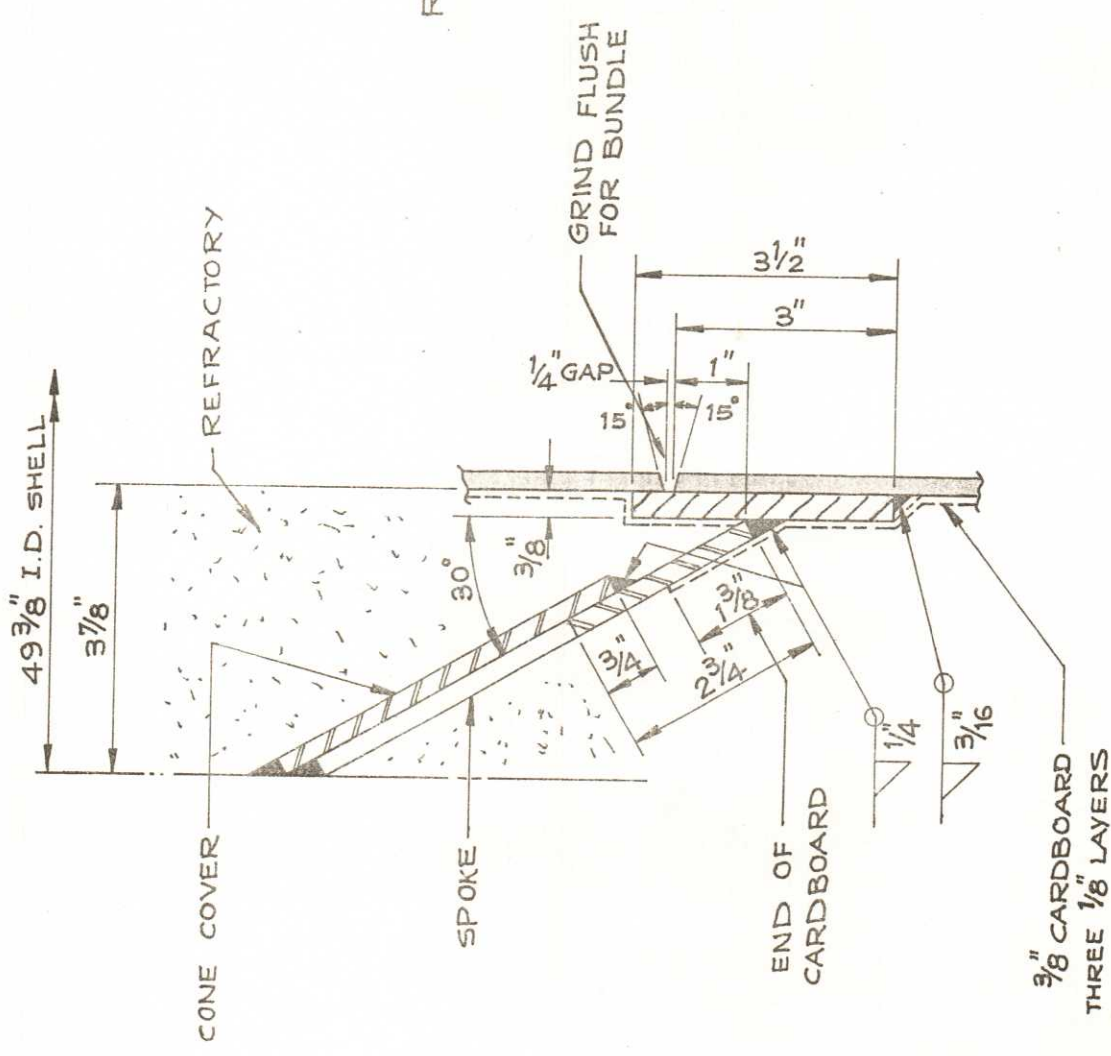
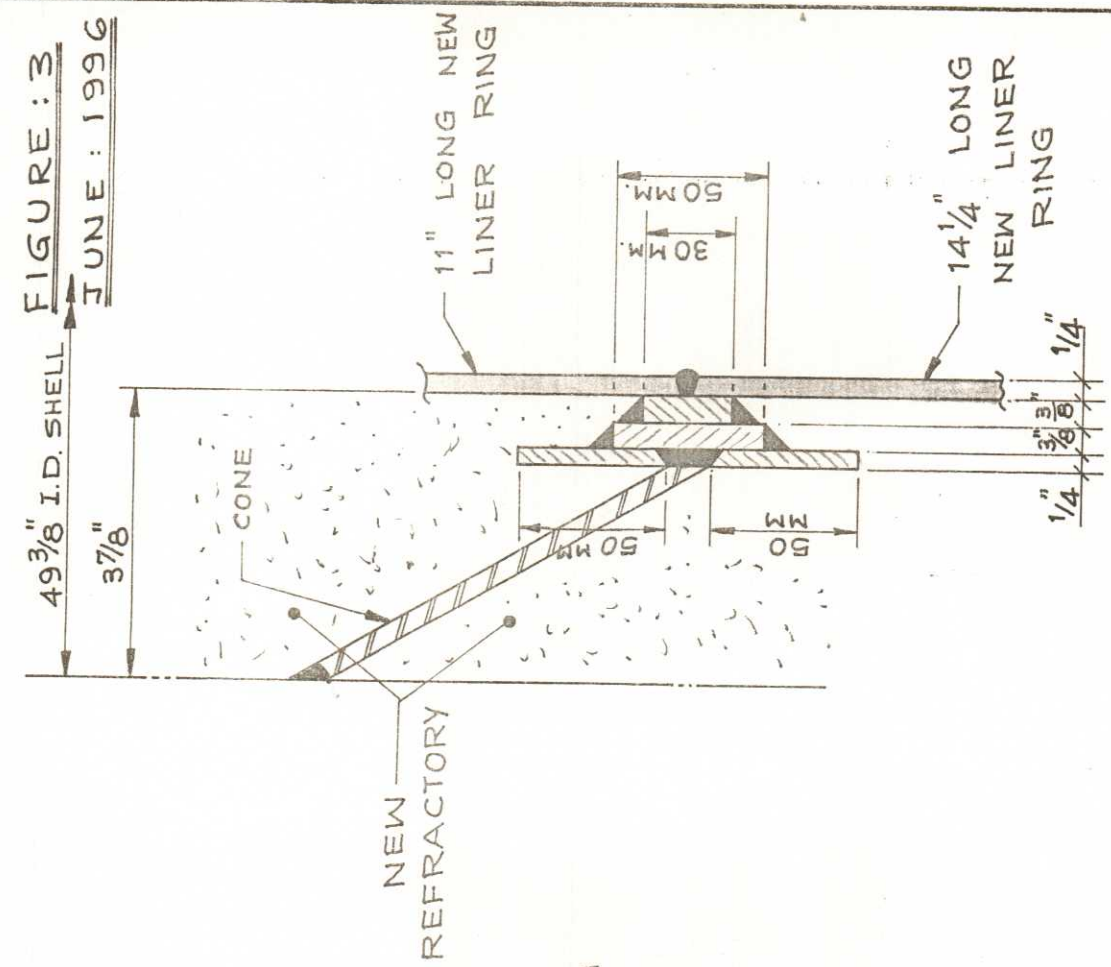
DETAILS OF SHELL LINERS OF 101-CA

FIGURE: 2  
JUNE: 1996



28

**FIGURE : 3**  
**JUNE : 1996**

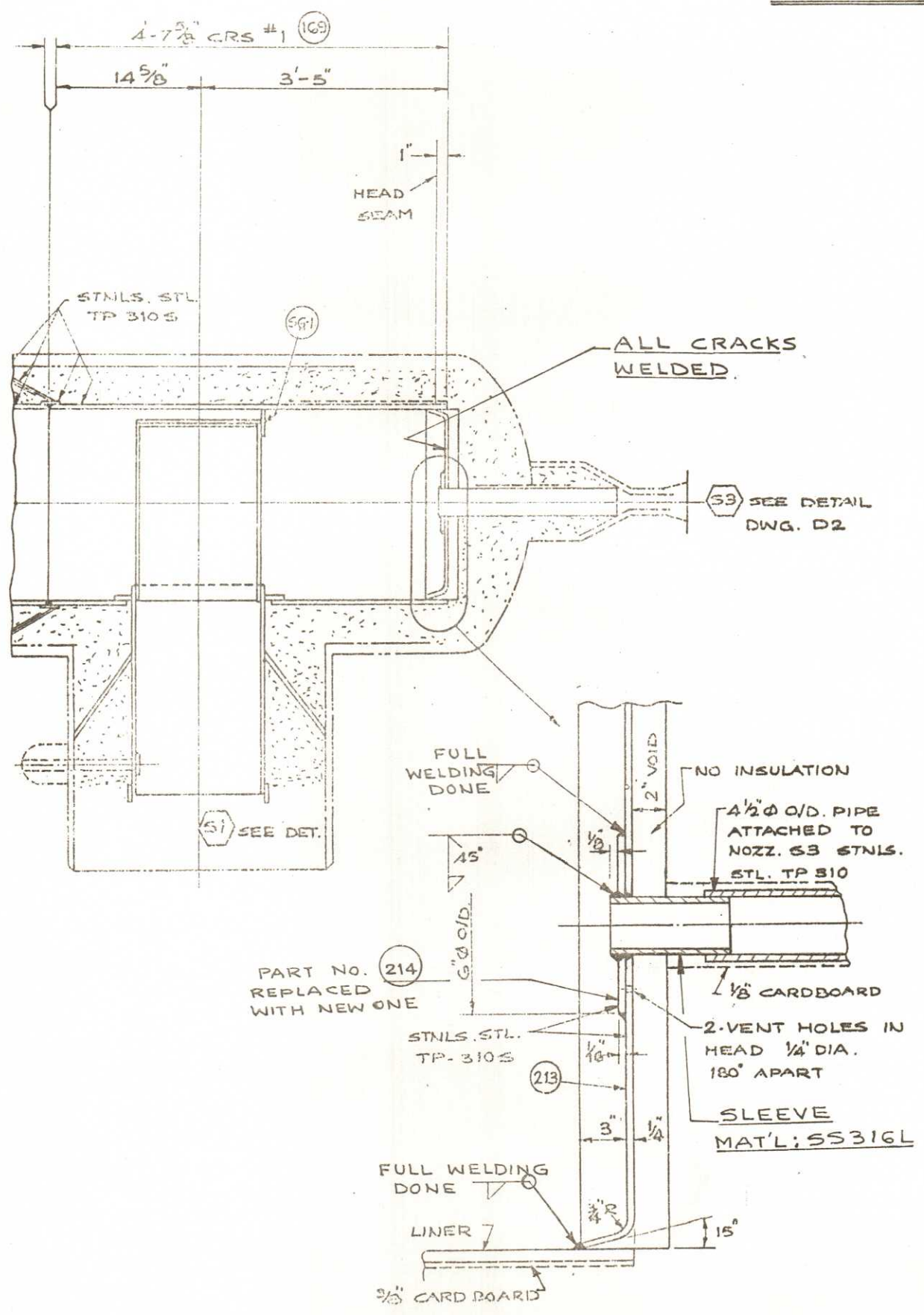


EXISTING DETAIL: "E"

REPAIRED DETAIL: "E"

DETAIL OF BOTTOM NOZZLE OF 101-CA

FIGURE: 4  
JUNE: 1996



CODE NO	JOB DESCRIPTION
5)	Removing the bulged portion and providing two new liners of 11" & 14.25" between the 5th & 6th liners. (Refer FIGURE : 2 & 3)
6)	Cutting the spare gas distributor on both sides by 1" lengthwise as it was not fitted in position because of bulging.
7)	Providing new GAS Distributer with minimum clearance of 1.75" for thermal expansion. (Refer FIGURE : 2 )
8)	Providing a support for distributor.
9)	Replaced part No.214 with New one at Bottom Nozzle (Refer FIGURE : 4)
10)	Full welding done of part No.213 with the Liner. (Refer FIGURE : 4)
11)	All cracks were welded on part No.213. (Refer FIGURE : 4)
12)	SS 316L Material sleeve is welded at Bottom nozzle. (Refer FIGURE : 4 )

On 1st July, spare tube bundle was placed and tightened. In the pressurised condition steam channel flange was leaking, for this hot tightening was done. This time for nut tightening hydraulic machine was used with hydraulic pressure up to 4500 psi.

01 15 02 ✓ **BOILER INSPECTION 112-C :**

Open inspection done on 18.06.96.

Bench Test of RVs (2 Nos) was done on 19.06.96 Boiler No. GT-1631.

	<u>Popping pressure</u>	<u>Reset pressure</u>
R.V.No.1 (Front)	10.5	9.5
R.V.No.2 (Rear)	10.5	9.5

**HYDROTEST :**

Hydrotest of 112-C (GT-1631) and 101-F (GT-1632) was done on 20.06.96.

112-C (GT-1631) at 15 Kg/cm<sup>2</sup>

101-F (GT-1632) at 135 Kg/cm<sup>2</sup>

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CODE NO                      JOB DESCRIPTION  
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R.V FLOATING OF 101-F (GT-1632)

Steam test of the Safety valves of Boiler GT-1632 was carried out the readings are as under on 20.06.96.

	RV(North)	RV(Middle)	RV(South)	RV(Super heater)
Set pressure Kg/cm2(g)	115	113	118.4	111.3
Reset pressure Kg/cm2(g)	111	110	110.6	108.8

01 17 01 NRV IN 104-J DISCHARGE LINE 6" NB X 900 # REPLACEMENT :

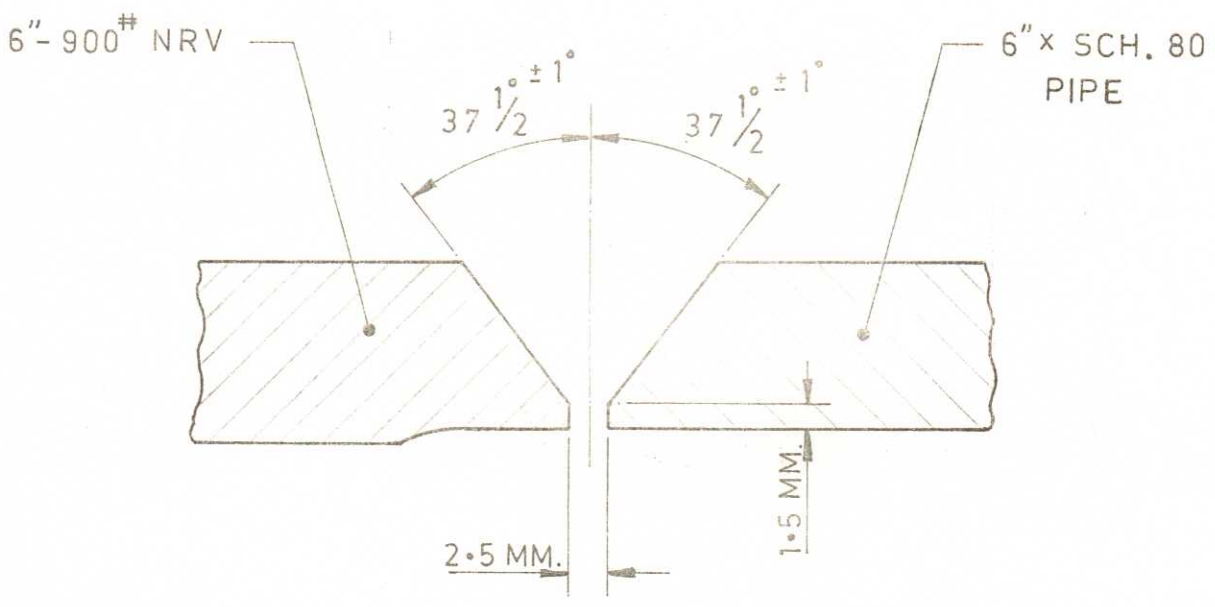
104-J discharge NRV was replaced with a repaired one, due to passing problem. The old NRV was made ready in workshop by welding WNRF flange after maintaining ID of valve to suit ID of flange, by welding. Proper heat treatment of the weld joint in Workshop as well as at site for field joint were carried out as per the heat treatment procedure as shown in Annexure : A For weld bevel detail Refer FIGURE : 1

**Annexure : A**

SR. NO.	JOB DETAIL	DATA	REMARKS
1	Existing Line cutting 6" Sch 80	ASTM A-53 Gr.B (Seamless pipe) ASTM A-234 WPB (NRV)	Gas Cutting
2	Edge Preparation & I.D. Matching	37 1/2 Deg. "V"	By Grinder
3	Feild joint set up	As per sketch	
4	Preheating	150 - 200 Deg.C	By stress Relieving Machine.
5	Root Run	Filler wire Citotig-T2 2.5 MM dia.	By Tig weld ing.
6	Dye penetrant test	-	By Insp.



FIGURE : 1



WELDED BEVEL DETAIL

SR. NO.	JOB DETAIL	DATA	REMARKS
7	Radiography Root Run	100%	-- do --
8	Preheating soaking for 2 Hrs.	150 - 200 Deg.C	By stress Relieving Machine.
9	Weld out	Supratherme AWS E-7018 Coated Electrode 2.5 MM	One Pass
		3.15 MM	Three Pass
10	Post weld Treatment	Upto Atmospheric Temp.	Cover the joint with Asbestos cloth
11	Final Dye Penetrant test	-	By Insp.
12	Final Radiography	100%	-- do --

01 17 02 VALVE REPAIR / REPLACEMENT:

- 1) LT-23 top isolation valve was roused
- 2) 104-JT exhaust drain valve was replaced and one more valve (3/4" dia 800 #) was provided.

01 19 01 SHIFT CONVERTER 104-D HTS AND LTS :

- 1) HCV-12 both side gland were repacked and u/s flange gasket was changed (12" dia 400 #)
- 2) SP-71 MOV was replaced by repaired one due to leakage.
- 3) 101-E gas inlet MOV was checked and found okay.
- 4) R.V. of 104-D1 was replaced due to passing problem.

01 23 01 MISCELLANEOUS JOBS:

- 1) 104-JT casing drain line thread leak was rectified by welding.
- 2) 112-J, JA & JB suction strainers were cleaned.
- 3) Condensate line of 150-C & 151-C were replaced.

PLANT TURNAROUND - 1996

35

AMMONIA PLANT

INSPECTION JOBS

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CODE NO	JOB DESCRIPTION
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01 41 01 Urea plant was required to be stopped due to Autoclave bottom dished end liner leakage. In turn, Ammonia plant was also stopped.

During June - July, 1996 the following major jobs were carried out in Ammonia plant.

- (1) Replacement of Air compressor LP Case Rotor.
- (2) Replacement of Syn.Gas compressor Turbine 103-JBT rotor.
- (3) Replacement of waste heat boiler 101-CA tube bundle.
- (4) Repairs of 101-CA shell liner.

(A) PRIMARY REFORMER FURNACE 101-B :

✓ The following inspection activities were performed in the Radiant zone. The detailed reports on inspection have been given to Maintenance and Production Department.

- (a) Visual inspection of catalyst tubes harps, roof insulation, burner blocks, bottom header insulation etc. The Report on observations made is reproduced below.

Visual Inspection of Reformer radiant zone carried out. The followings were the observations:-

Burner Row No. 1: Refractory blocks of burner Nos.2 and 7 were damaged.

Burner Row No.2 : All burner blocks were in satisfactory condition.

Burner Row No.3 : Burner blocks Nos.1,2,4,7,10 and 12 were partially damaged.

Burner Row No.4 : All burner blocks were in satisfactory condition.

Burner Row No.5 : Burner blocks Nos. 7 and 13 were damaged.

Burner Row No. 6: Burner blocks Nos. 7,10 and 14 were damaged.

CODE NO	JOB DESCRIPTION
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Burner Row No.7 : Burner block No.9 was found damaged.

Burner Row No.8 : Burner blocks No. 1,6,9 and 12 were partially damaged.

Burner Row No. 9 : Burner blocks No., 2,3,4,6 and 9 were damaged partially.

#### TUNNEL SLABS:

Row No. No. of damaged slabs.

1	-	NIL
2.	-	NIL
3.	-	5 NOS.
4.	-	2 NOS.
5.	-	4 NOS.
6.	-	2 NOS.
7.	-	NIL
8.	-	2 NOS.
9.	-	NIL

#### BOTTOM HEADER INSULATION:

Bottom header insulation layer was found detached from the following locations.

Row No.1 : Below tube No.1 & 2, below riser between tube Nos. 27 & 28, 36. Header got exposed between tube Nos. 27 & 28 in bottom half.

Row No.2: Below tube No. 10 & 11. header got exposed between tube No. 15 & 16, below 17, between riser and tube No.22. below tube No. 27 & 28 (Header exposed), below tube No. 36 & 37.

Row No.3 : Below tube No.s 14,15,16,22,26 to 28.

Row No.4 : Between riser & tube No.22, below tube No. 30 to 33.

Row No.5 : Below tube No.2, 15 & 16, 20 & 21, 22 & 23, 29 to 32.

Row No.6: Below tube No. 1, 15 & 16, 21 & riser riser & 22, 27 & 28, 30 and 31.

Row No.7 : Below tubes No. 5 & 6, 14 & 15, 21 & riser, riser & 22, 27 & 28, 33 to 37.

CODE NO	JOB DESCRIPTION
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Row No.8 : Below tube No.1,6,7,8,21 & riser, riser & 22, 26,29,33,41 & 42.

Roof Insulation got damaged at the following locations:-

Row No.2: Tube No.2 to 12, nearby roof insulation blocks shifted downwards.

Row No.5: Roof insulation got detached from roof between burner blocks No. 3 & 9 and 12 & 13 causing roof plate exposure.

Row No.6 : Strip of roof insulation near burners No.6,8,9,10,11,12 had come out. Between Burners 13 & 14, roof insulation block fallen down.

Tube Row No. 8 : Roof insulation had partially come out near tubes No. 19 & 20 (at the roof).

MISCELLANEOUS:

- A) Weldolet insulation of tubes No.22 to 25 of row no.6 needed to be repaired.
- B) Radiant zone East Wall brick lining appx. 4 NMtr. height from tunnel slab level had got deformed. This needed to be attended to prevent occurrence of further damage/to prevent it from getting collapsed in operation.
- C) Bricks just above East wall manhole had got loosened.
- D) Canister insulation cover ring of riser No.8 had got detached from position.
  - (b) Creep measurement of outlet header.
  - (c) D.P. test of outlet header field weld joints (two joints of each header)
  - (d) Ultrasonic testing of dissimilar metals weld joint (Between G 4852 and P-11) of catalyst tubes No.138,139,140,141,142,206,207,208,209,210,211, 732,733,734,735,736,737,838,839,840,841 and 842 (Total 22 tubes). No significant defect was observed during the test.
  - (e) Bottom head clearance from the floor was measured.
  - (f) Radiography of catalyst tube No.138,139,140, 210,211,732,733, 836,838 dissimilar weld metal joint was carried out. No defect was observed.

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CODE NO	JOB DESCRIPTION
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(g) Radiography of outlet header field welds was carried out. No service defect was observed.

(h) Catalyst tube spring hanger readings in cold condition were taken.

The reports on observations have been prepared and are attached herewith.

(B) WASTE HEAT BOILER 101-CA:

During hydrotest, leakage was observed from the tube bundle of waste heat boiler, 101-CA. Tube bundle was taken out for replacement. The visual inspection of the shell from inside was carried out after removal of tube bundle. Following observations were made.

- 1) The drain nozzle pad welding at bottom liner plate had got cracked and the drain nozzle pipe had got free to move upwards.
- 2) The bottom most liner segment had got badly warped. The liner bottom moved upwards by approx. 8" and got fractured in approx. 5" Circ. length on North side. The bottom liner to the bottom most course of the shell liner weld had got cracked in approx. 40" circ. length particularly on sec. Reformer side i.e North-East side and south side.
- 3) The bottom most shell liner segment had got badly buckled and wrinkled by appx. 4" and also had moved downwards causing exposure of shell refractory lining at the junction between the liner segments (2nd and 3rd liner courses)
- 4) The gas distribution header had got fractured and opened out by approx. 6". The supports and pads provided on the liner for the distributor had got deformed. In bottom half, welding of the header pad with the liner had also got cracked.
- 5) The butt welding of the bottom most liner and the second liner segment from bottom was found cracked in approx. 3 feet circumferential length where gridding of the line plates was seen.
- 6) The second liner segment (counting from bottom) had also got badly warped and wrinkled by approx. 2.5" to 3" in 50% circumference particularly on south side.

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CODE NO                      JOB DESCRIPTION  
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In view of the abnormal damages observed in the shell liner (and also the erosion of refractory was noticed) ; it was decided to replace the defective portion of the liners with new one.

The removal of the defective liner segments and replacement of distribution header was carried out departmentally by workshop group.

(C) SECONDARY REFORMER 103-D :

Visual inspection of secondary Reformer Bottom Dome Bricks and inlet nozzle of waste heat boilers was carried out. The observations of visual inspection are given bellow.

1) BOTTOM DOME BRICK SECTION 103-D:

- (a) One dome brick was found damaged on 2nd circle from centre due to spalling. The depth of damage was found to be about 10 to 12 mm.
- (b) 14 Nos of holes were partly checked on dome brick.
- (c) Skirt liner sleeve got buckled irregularly towards inside by 5" to 6" max. on 50% circumferential length towards both side

2) WASTE HEAT BOILER 101-CB :

- (a) Gas distributor pipe was found cracked along the length at the middle location (ie longitudinal seam) on both the sides and bottom half of the liner got buckled towards inside by 4" approx. at the cracked portion. Due to this, an opening of 5" to 6" width approx. was observed along the cracked portion of distributor pipe. However, the distributor pipe is intact in its location.
- (b) Minor buckling of stub end flange was observed on north side.
- (c) Three nos of damaged pieces of refractory bricks were lying in the gas inlet path just below the distributor pipe.

(D) STEAM DRUM 101-F:

Visual inspection and ultrasonic thickness measurement of steam drum were carried out. The followings were the observations.

- 1) The shell had assured blackish grey colouration.

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CODE NO	JOB DESCRIPTION
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- 2) Scattered shallow pittings, dent marks and mill scales were observed on both the dished ends and shell.
- 3) The holes of the BFW distributor header were observed to be enlarged due to erosion and were found oval/irregular shaped. This was predominant on south side segment as compared to middle and North segment of this header. Maximum hole size was found to be 1 1/4" approx.
- 4) The fasteners connecting the middle and North segment of BFW inlet pipe were seen to be corroded particularly at bolt heads and nuts.
- 5) Five Nos bolts of west side support plate and two bolts of west side cyclone scrubber were found missing.
- 6) Seven no. bolts of East side support plate were found missing.
- 7) One No. bolt of the plate behind the East side cyclone scrubber was missing.
- 8) All other fittings were intact.
- 9) Thickness measurement report is enclosed herewith.

(E) MISCELLANEOUS JOBS :

The following miscellaneous jobs were carried out during shutdown. The findings were verbally conveyed to the concerned engineers for necessary action.

- (i) D.P. test of various tappings taken during Shutdown (Job done by M/s Duggal Engineers) was carried out. Defective points were removed and finally all the joints were cleared in D.P. test.
- (ii) D.P. test after edge preparation, root run and final welding were carried out on NRV weld joints in the discharge line of 104-J BFW Pump. Radiography after root run and after final welding were done.
- iii) BFW Coil inlet reducer ( 6" x 8" ) which was built up in the past due to thickness reduction was replaced during the shutdown. The weld joints were D.P. tested after root and final welding. Also, radiography of final welding was carried out.



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 CODE NO                      JOB DESCRIPTION
 

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- iv) Ultrasonic thickness measurement of mixed feed coil tubes in HT Convection Zone was carried out. Detailed report is attached herewith.
- v) Gauss (Residual magnetism) measurement on the following high speed rotating machine components was carried out.
- a) 101J Air Compressor LP case new rotor, north & south bearings.
- b) 102 J NG Compressor south bearing housing.

The report on magnetism valves recorded is attached herewith.

**(F) PIPELINES THICKNESS MEASUREMENT**

Ultrasonic thickness measurement of the following pipe lines was carried out in June, 1996.

Sr. No.	Line No.	Size	Sr. No.	Line No.	Size
1.	BF-1	12"	31.	MEA-12B	12"
2.	BF-2	10"	32.	MEA-20	12"
3.	BF-3	10"	33.	MEA-21	12"
4.	BF-4	6"	34.	MEA-25	3"
5.	BF-6	6"	35.	MEA-26A	2.5"
6.	BF-7	6"	36.	MEA-26B	2.5"
7.	BF-15	6"	37.	MEA-61SS	14"/12"
8.	BF-22	8"	38.	MS-9	10"
9.	CW-4	10"	39.	MS-12	8"
10.	CW-6	36"	40.	MS-13	8"
11.	CW-7	36"	41.	MS-14	8"
12.	CW-9	10"	42.	NG-22	4" (6")
13.	HS-9	8"	43.	NG-26	6"
14.	HS-10	6"	44.	NH-16	6"
15.	HS-11	6"	45.	NH-36	1.5"
16.	HS-12	6"	46.	NH-41	6"
17.	HW-11	8"	47.	NH-50	4"
18.	HW-17	10"	48.	NH-52	2"
19.	HW-21	16"	49.	NH-56	1.5" (2.5")
20.	HW-22	16"	50.	NH-58	6"
21.	HW-25	10"	51.	NH-75	10"
22.	LS-10	8"	52.	NH-88	6"
23.	MEA-1	12"	53.	NH-88A	6"
24.	MEA-7	12"	54.	NH-89	4"
25.	MEA-9A	10"	55.	NH-89A	4"
26.	MEA-9B	10"	56.	NH-119	4"
27.	MEA-10A	12"	57.	NH-121	6"
28.	MEA-10B	12"	58.	NH-51	1"
29.	MEA-11	14"	59.	PG-6	18"
30.	MEA-12A	12"	60.	PG-6	16"

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CODE NO	JOB DESCRITPION				
	Sr. No.	Line No. Size	Sr. No.	Line No.	Size
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	61.	PG-15 14"	76.	SG-32 6"	
	62.	PG-18 12"	77.	SG-39 4"	
	63.	PW-5 2"	78.	SG-42 4"	
	64.	PW-18 4"	79.	SG-45 6"	
	65.	S-7 6"	80.	SG-51 8"	
	66.	SC-4 4"	81.	SG-47 1"	
	67.	SC-5 4"	82.	SG-79 1"	
	68.	SC-6 4"	83.	WA-1 36"	
	69.	SC-17 3"	84.	WA-2 36"	
	70.	SC-17 2"	85.	WA-3 36"	
	71.	SC-51 2"	86.	WA-12 16"	
	72.	SC-53 2"	87.	WA-13 16"	
	73.	SC-70 1.5"	88.	WA-17 8"	
	74.	SG-1 12"	89.	HW-18 24"	
	75.	SG-11 10"	90.	HW-19 24"	

PLANT TURNAROUND - 1996

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AMMONIA PLANTCIVIL JOBS

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CODE NO	JOB DESCRIPTION
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01 51 01 PRIMARY REFORMER 101-B JOBS :

- a) Refractory lining on burner face, repairs of burner block.
- b) Target wall - Rebuilding
- c) Refractory work on header.
- d) Cleaning, Manhole repairs.

PRIMARY REFORMER 101-B H.T.ZONE JOBS :

- a) Replacement of Tunnel slab.
- b) Manhole side Insulating brick lining repairs.
- c) Cleaning of complete reformer.
- d) Insulating plaster work on ceiling and column of Transit zone.
- e) Insulating plaster on side of L.T.Zone.
- f) Opening and closing manholes.

WASTE HEAT BOILER 101-C :

- a) Dismantling damaged Refractory lining.
- b) Refractory lining on cell of waste heat boiler by Plibracko - 606 and wet felt Insulation.

Opening of Cooling Tower lines including dismantling concrete. Excavation, Refilling with sand and concreting the same near (a) 110 CA-CB, (b) 127-C, (c) 124-C

## PLANT TURNAROUND - 1996

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## AMMONIA PLANT

## ELECTRICAL JOBS

CODE NO	JOB DESCRIPTION
01 61 01	01) Preventive maintenance carried out on TR-6. a) Checked and tightened secondary end terminals of cables, inspected and cleaned bushings. b) Carried out cleaning and painting of transformer.
	02) Carried out preventive maintenance of TMG L.T. ACBs installed in MCC-5. a) Cleaned the contacts and mechanism. b) Checked contact pressure and adjusted. c) Lubricated the mechanism & all the moving parts. d) Checked tripping and closing timing for uniform opening and closing of poles.
	03) Preventive maintenance carried out on MCC-5. a) Checked and cleaned all feeder compartments. b) Replaced defective Lyra contacts of 112-J feeder compartment and recrimped cable end terminals. c) Replaced defective Lyra contact of 108-J feeder compartment. d) Replaced power contactor of 2004-J and defective BMR of 101-J.
	04) Carried out retermination of incoming cable of MCC-5 as old cable got overheated.
	05) Replaced 101/105 lube oil pump Auto/manual selector switch with indigenous one.
	06) Laid control cables for 101J and 103J from MCC-5 for Ammeter control stations.
	07) Replaced power cable of 121-J & 121-JA with higher size cable ( i.e. 3 X 35mm <sup>2</sup> ).
	08) (a) Checked, cleaned and adjusted limit & torque switches of all Motor Operated Valves as per production requirement. (b) Carried out modification and repairing on SP-158, which was damaged earlier.

In addition to above jobs, provided connections to Hydrojetting machines, vaccum blowers, flood lights, hand lamps, telephone connections etc. as per requirement during shtudown.

## PLANT TURNAROUND - 1996

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## AMMONIA PLANT

## INSTRUMENT JOBS

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CODE NO	JOB DESCRIPTION
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01 71 01 CONTROL ROOM JOBS :

1. 103-J Becon digital speed indicator mounted on main panel by cutting panels & its wiring completed.
2. VR-4 (Taylor recorder for N.G. Compressor) all points shifted to TR-16 Yokogawa hybrid recorder as VR-4 is obsolete model.
3. Air header flushing in C/R for main panel and servicing of air filter regulators.
4. Air header flushing in C/R for PGR panel & replacement of air filter regulators imported with indigenous 'Norgen' make;
5. Checking & cleaning of vibration panel instruments is carried out.
6. Overhauling, general maintenance, orifice cleaning & calibration of main panel all Taylor make recorders, indicators and controllers were carried out.

FIELD JOBS :1. CONTROL VALVES :

- a) FRCV-2 valve was removed from line. Dismantled it. Overhauling of all parts were done. Found little roughness on stem of control valve in gland packing area, made it ok by fine amryply paper & assembly was done and gland was replaced. Also checked diaphragm, its leakage found ok overhauling of air regulator and valve positioner was also done. Bottom flange and top bonnet jacketed gaskets were replaced with new gaskets. Stroke checking was also completed.
- b) MICV-61, Valve was removed from line, dismantled it. overhauling of all parts were done. Plug was getting slightly stuck in cage got fine cut on cage to make valve movement free.
- c) LCV-3B, Valve was removed from line as it was passing, changed its plug/seat with new set. Also overhauling of full valve, air regulator and positioner was done. Checked diaphragm for leakage, found ok. gland packing were replaced with new packings., Also stroke checking was completed.

CODE NO	JOB DESCRIPTION
d)	TRCV-10, Gland packing was done, also its diaphragm changed with new diaphragm. Its general maintenance was done, cleaning of positioner and regulator was done.  Also its casting link which was found broken, got fabricated in mech. w/s fixed it and on getting clearance checked its stroke found ok.
e)	TRCV-11. General maintenance of valve, its positioner, regulator was done. connecting link alignment carried over. Also checked diaphragm for leakage found ok. Finally stroke of the valve was checked, found ok.
f)	TRCV-12 General maint were done, diaphragm checked found ok. Finally stroke checked.
g)	LCV-13 Valve was opened from line for Plug/seat inspection, found both in good condition. Carried over general maintenance of valve, positioner, regulator.. Then fixed it back. Provided new gland packings, checked diaphragm for leakage, found ok. Finally checked the stroke found ok.
h)	FICV-12 & 14. General maint. of both valves, their positioners and regulators was done. Also checked the diaphragm of both valves for leakage, found ok. checked both valve actuators for looseness. Tighten yoke nuts for both valves. Finally checked the stroke of both valves.
i)	PICV-13A & 13B. General maint. of both valves, their positioners, regulators and boosters was done. Finally checked the stroke of both valves.
j)	NG Compressor PCV of lube oil was removed for overhauling. Its overhauling & general maint. was carried over. Also plug & seat was inspected, which were found ok. After fixing back its operation was checked and found ok.
k)	MICV-23, Valve was removed from line. Suspected plug & seat found ok. Its general maintenance was done. Checked diaphragm for leakage found ok. Checked its stroke and adjustment was done, as it was less. Now stroke is ok.
l)	FICV-7,8,10,11, FRCV-1 & PRCV-18 Control valves general maint. of valves, their positioners & regulators were done. Also checked for their diaphragm leakage found ok. Finally the stroking of all valves were checked, found ok.

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CODE NO                      JOB DESCRIPTION

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- m) FICV-9 Control valve stem connecting block bolts were found loose. also lock nuts were away from block. Tighten all the bolts. Also locked it properly. Carried over general maint. of valve, positioner and its regulator and also checked diaphragm leakage, found ok. Finally stroke was checked, found ok.
- n) As a preventive maint. following valves were cleaned their lubrication and painting were done.
- V-4, V-5, PCV-26, MICV-19, TRCV-11, TRCV-12, LCV-27, LCV-17, V-6, LCV-20, FRCV-1, MICV-10, MICV-11, FICV-16, FICV-17, FICV-19, PICV-8, PICV-7, LCV-5, LCV-7, LCV-21, THIC-60, FRCV-18, LCV-15, FICV-19, FICV-202, V-151, PICV-5, LCV-26, PICV-10, PICV-17, FRCV-5, V-7, V-18, THIC-13, FICV-14, LCV-8, PRCV-1, MICV-1 TO 9, MICV-27 TO 32, FICV-12, LCV-19, LCV-21, PICV-25.
2. TI-1-25 Thermowell (MEA-line) removed, got removed broken in nipple in machine shop and fixed back by providing new nipple.
  3. TI-1-69, TI-1-73 & TI-1-76 All the three Thermowells with Thermocouples assemblies were changed with new units, as old assemblies were damaged & T/Cs were found open. Made them ok.
  4. TI-1-85 Thermocouple assembly with Thermowell replaced with new one. as old went out of order during plant shutdown.
  5. 120-C outlet line old Thermowell replaced with new one as old one was leaking.
  6. 101-F metal temp. point 5 & 9 were reported not ok. On checking found both Thermocouples open. Replaced both thermocouples and made both points ok.
  7. Eye-Hye unit general maint. carried over - 9 pt. electrode replaced with new one as old was slightly damaged. Painting of its box was also done, also flushed its chamber, checked performance found ok.
  8. PT-82 new electronic transmitter mounted connected to Digital indicator in Control room, after completion of wiring impulse tubing on steam drum. Welding of Transmitter stand was also carried over as it was broken.
  9. LIC-1 general maint. carried over. Its regulator overhauled and flushing of air header was done.

CODE NO

JOB DESCRIPTION

10. COMPRESSOR AREA JOBS FOR 101-J, 103-J, 105-J & 102-J :

Removed the vibration probes, pressure gauges, temp. gauges, thermocouples etc., to facilitate for the mechanical jobs on the main equipment. fixed them back after the completion of mech. job & set the probes as per stand off gap voltage and axial probes as per floats.

101-J

- i) TA-90 new cable was laid from Thermocouple to switch in annunciator 'D' and connected its both ends and line up as the old cable was defective.
- ii) Provide new extension cable for it 3H,4V. 9A & 9B vibration points.
- iii) Provided new probe of 4V.
- iv) 101-J governor positioner , its lock out relay general maint. was done and fixed back, finally stroking was done.

103-J

- i) 1V, 10A, 10B, 9A, 9B, BA, BB, 8V & 8H probes were changed with new probes as they were found damaged.
- ii) Extension cable of 2V & 8H were replaced.
- iii) MIC-23 was removed from governor. its maint. was carried over and fixed back. Finally its stroke was checked.
- iv) PRC-12 lockout relay function was checked, its air regulator was changed with new one and overall stroke was checked after charging oil.
- v) 103-J L.O. console low level alarm switch provided and annunciator is given in Annunciator D.

105-JPDS-64

LP case diff. seal oil switch was not functioning, removed it. filled oil in primary assy. calibrated and fixed back.



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CODE NO	JOB DESCRIPTION
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102-J

- i) Turbine axial probe was replaced with new one, as old was found damaged.
  - ii) Compressor thrust pad's thermocouples were soldered on new pads given by mechpeople and fixed back. Also checked their performance found ok.
  - iii) Turbine thrust & general bearing thermocouples were fixed after checking for pt. no. TR-3-32&33.
  - iv) N.G. Compressor local control room panel air regulators were overhauled and header was flushed and fixed back.
  - v) Changed the diaphragm of V-51, as it was leaking., After that checked the performance of the valve, found ok.
  - vi) Setting of PSL0-332 (Trip) changed from 3.3 kg/cm<sup>2</sup> to 4.5 kg/cm<sup>2</sup> against MWO No. 15634 dated 12.7.96 issued by P/P.
- All compressors trip switches were checked with production people.
- 11) Air Dryer, Air receiver and flushing points on different floor for air were flushed. In addition to points provided for flushing, air was flushed through all important instruments in field before and after air regulators. Also flushed air regulators on different floors and removed dust, sediments, water etc.
  - 12) Plant load taken on APLAB Unit from UPSS. Took batteries readings and switched off charger/inverter as MCC-5 was under maint. After maint. of MCC-5 switched on charger/converter and put the batteries under charging. After charging batteries reading were recorded and kept system ready.
  - 13) PDI-52. was removed to facilitate ID fan work. Full switch was overhauled, painted and calibrated. Also changed its location by providing new wiring and tubing, so that there should not be any need to remove it while mech. jobs are done in future.
  - 14) FR-95 Pitot venturi tube was removed from line, this was flushed with air and fixed back.
  - 15) PDI-53 & 55 old pneumatic transmitters were removed from line.

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CODE NO	JOB DESCRIPTION
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- 16) AR-7 PH meter old box was removed from field as it was not required.
- 17) All instruments related with ISO were calibrated and records were maintained.
- 18) All work related with Boiler inspection were carried over.
- 19) Attended control valve 5153 and its controller in C/R was checked and stroking of valve made ok.
- 20) PDI + 36 & 37 tubing were removed and mech. supports were cut to facilitate mech work of 101-CA. After mech. work completion fixed tubing of above transmitter and supports were welded.
- 21) In PGR plant LIC-134 transmitter calibration was checked found ok. "Also the LP side impulse of this transmitter was given extra elevation.
- 22) Provided necessary test kit for governor checking of ID fan as per requirement of mech. people at various point of time.
- 23) 104 JT & 107 JT solenoids were removed and fixed back after mechanical work. Also removed temp. & pressure gauges of 104 JT & 107 JT to facilitate mech. work & fixed back after mech. work completion.
- 24) Attended all start up jobs as per MWOs issued by P/P and verbal instruction also.

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AMMONIA PLANT

TECHNICAL JOBS

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<u>CODE NO</u>	<u>JOB DESCRIPTION</u>
01 81 01	(01) Removed of steam jet Thermo-compressor.
	(02) Provided A.G to Tunnel Burners.

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UREA PLANT  
MECHANICAL JOBS

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CODE NO            JOB DESCRIPTION  
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02 01 01        CO2 CENTRIFUGAL COMPRESSOR K-1101/1  
                  AND ITS DRIVE TURBINE Q-1101/1:

*\*Noted*

01) REPLACED OLD COUPLING BY ANTISLUDGE COUPLING :

- Dismantling :-
- 1) Removed all instrument probes connected to bearings and coupling guards.
  - 2) Removed the coupling guard.
  - 3) Stopped lube oil circulation.

	Before Replacement (old coupling)	After Replacement & cleaning (New antisludge coupling)
Coupling float	2.78 MM	2.78 MM
Axial thrust on compressor End	0.43 MM	0.43 MM
Axial thrust on turbine End	0.33 MM	0.35 MM

Journal & thrust bearings beings of both compressor and turbine cleaned. After cleaning clearance was taken by lead wire. readings are given below.

	Clearance
Journal bearing of compressor (coupling end)	0.21 MM
Journal bearing of turbine (coupling end)	0.20 MM
Journal bearing of turbine (Governor side)	0.16 MM
Journal bearing of compressor (Thrust side)	0.25 MM

Blue print of hub was taken on taper shaft. It was found full impression (nearly 90%)

Clearance between overspeed trip lever & overspeed trip plunger. 0.021"

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CODE NO                      JOB DESCRIPTION  
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02) MODIFICATION OVER OLD COUPLING :

*\* Noted*

- This antisludge type coupling which perserve certain speciality over old one as follows.
- Hub cover fixed its position by retainer ring, whenever we have required to clean, it will be easily dismatled by removing retainer ring.
- Made arrangement for oil entry from both side of coupling. So it will prevent deposition of sludge between teeth.
- Made holes on circumference of hub cover which provide passage for oil mud to come out due to centrifugal force.
- Aluminium oil gaurd modified for easy movement of barring gear.

02 01 02    CO2 RECIPROCATING COMPRESSOR (PB) K-1101-2:

01) REPLACED THIRD STAGE PISTON :

*\* Noted*

During running condition production people complained about pressure dropping in third stage. At that only suction and discharge valve were changed but performance was still not satisfactory, so it was believed that piston ring bearing pad may be weared and clearance between cylinder - piston might be increased. After dismantling thid stage piston from cylinder bore following things were found as follows.

- Piston rings were broken into pieces and bearing pad clearance was also reduced.
- Oil seal (wipper ring) gas seal / gas cup assembly radial and axial rings) were not in good condition.

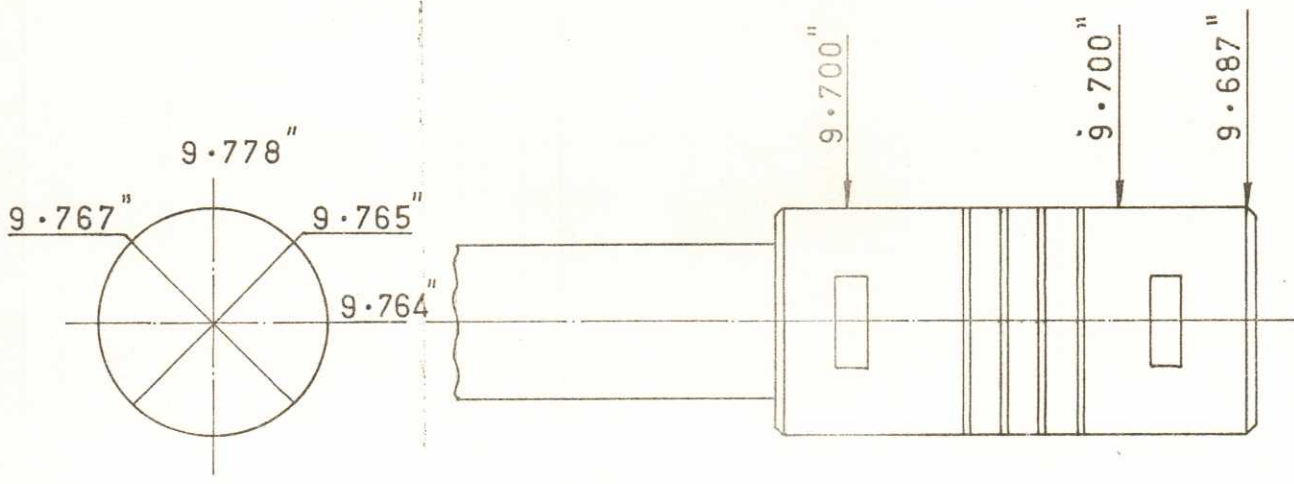
02) RECONDITIONED PISTON :

Piston dia with pad was 9.780" but required dia of piston with pad 9.727"so it was send for machining in workshop. (Refer FIGURE : 1 & 2)

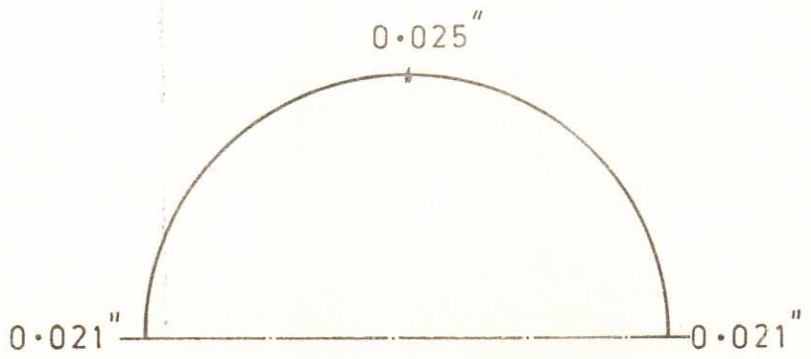
- Gas packing cap replaced by reconditioned  
cap depth        :    20.02 MM
  - Thickness of radial pressure breaker        :    9.93 MM
  - Thickness of Tangential seal ring         :    9.95 MM
- Total    19.88 MM

Blue test taken on piston rod for checking clearance of radial pressure breaker seal.

FIGURE :1  
JUNE - 1996

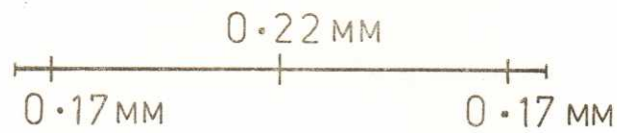
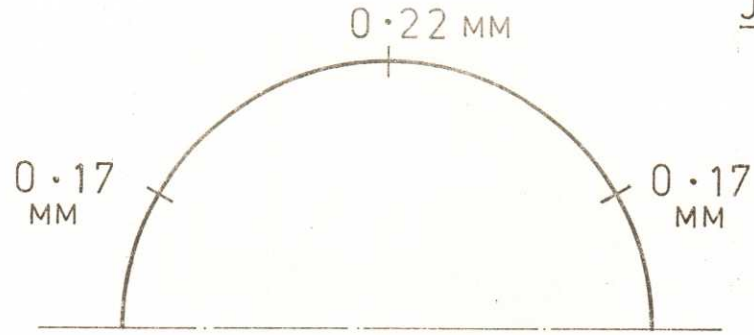


CYLINDER BORE DIA.  
ORIGINAL CYLINDER DIA. 9.752"

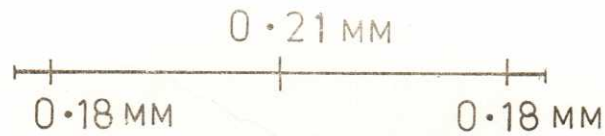
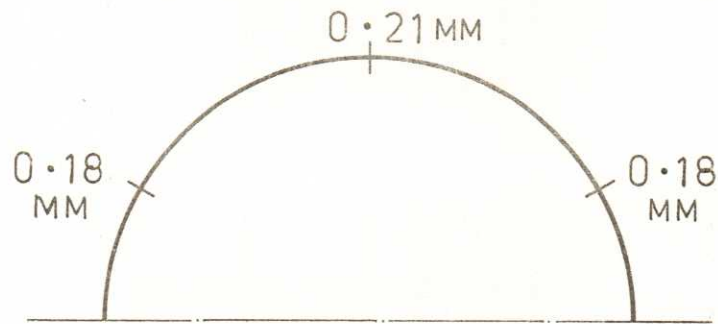


CROSS HEAD CLEARANCE ON  
CROSS HEAD BED AT UPPER PORTION

FIGURE :2  
JUNE - 1996



CLEARANCE OF JOURNAL BEARING  
ON GEAR BOX SIDE



CLEARANCE OF JOURNAL BEARING  
ON GOVERNOR SIDE

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 CODE NO                      JOB DESCRIPTION  
 -----

- End gap of piston ring kept 1.25 MM by filling.
- Wipper ring (oil seal) clearance checked on piston rod by blue print.

✓ 03) FINAL BOXED UP :

- Piston with piston ring inserted into cylinder by crane.
- After inserting piston lock nut tighten with proper clearance.
  - Firstly cup inserted then radial pressure breaker and tangential seal ring fitted in each cup (total eight cup)
  - After assembling gas packing it was found that cup assembly was shorter 4.0 MM.so it was dismantled the last cup clamping plate send for face machining by 6.0 MM.
  - Wipper oil packing tighten on piston rod.

✓ 04) FINAL READING SET UP :

- BDC of piston checked found : 4.08 MM
- After boxed up of piston assembly final run out taken by rotating flywheel.

	TDC	Middle	BDC
V	0	- 0.001"	+ 0.002"
H	0	- 0.001"	- 0.001"
V	0	- 0.001"	+ 0.001"
H	0	- 0.001"	- 0.001"

- Crosshead clearance on crosshead bed at upper portion.

02 01 03 TURBINE FOR CO2 RECIPROCATING COMPRESSOR Q-1101/2 :

- Clearance of journal bearing after cleaning on gearbox side : 0.22 MM.
- Cover of bearing housing on governor side opened and cleaned. Axial float : 0.42 MM.



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 CODE NO                      JOB DESCRIPTION  
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- Governor system starting device, lever, connecting line opened and cleaned.
- Opened governing lube oil system and flushed.
- After cleaning governor assembled and all lines of lube oil fixed up.
- Clearance of journal bearing on governor side was found after cleaning.

02 02 01 AMMONIA PUMP P-1102/A : *Noted*

"O" Rings of suction and discharge valve cover replaced.

02 02 02 MELT PUMP P-1408 :

Pump alignment is done.

*Noted*

Radial		0.00	Face		0.00
+ 0.03MM		R	- 0.03MM		F      - 0.02MM
		-----			-----
		0			
		+ 0.03 MM			- 0.05 MM

02 03 01 PRILL TOWER FANS K-1401/1 TO 4 :

Bearing cleaned and greased, cleaned fan blades & body.

02 15 01 4 ATA STEAM DRUM BOILER IBR TEST V-1501 (GT-1664) :

- 1) Open Inspection carried out                      : 18.06.96
- 2) Both RV's tested on Test Bench                : 20.06.96
  - Popping pressure                      : 7.5 ata
  - Reset pressure                         : 6.5 ata
- 3) Hydro test done at 9.7 Kg/cm2                : 20.06.96

02 17 01 INSPECTION, REPAIR AND TESTING OF VALVES :

- BEL Second I/V of upstream (LRCV-1201) hand lever and Actuator reconditioned for free movement.
- K-1702 condensate isolation valve replaced.
- P-1210 to H-1209 flash drain valve changed.

CODE NO	JOB DESCRIPTION
	- In Hydrolyser system removed cooling water return Isolation (Middle valve) and provided straight line in the both pump and discharge line modified in pump-B.
	- Condensate to T-1701/A dust dissolving Gate valve gland replaced.
<i>Labeled</i>	- P-1201/A discharge line Isolation valve repaired by cutting and lapping the valve bottom seat.
	- Bonnet of HPE to HICV-1202 Ist I/V leak attached.
	- PVC-1501 u/s Isolation valve (1st floor) gland packing replaced.
	- CO2 to H-1203 at prill tower top replaced two number bonnet of 1" valve roused and 1/2" BEL valve.
	- NH3 to preheater line vent valve (1" x 800 # globe valve) replaced by new one.
	- Assembled the drain valve (1" BEL valve) of P-1201/A discharge at first floor with reconditioned bonnet.
	- Unloading valve body & bonnet of Autoclave changed.
	- H-1202 NH3 carbamate line isolation valve made operatable. Taylor valve also made operatable.
	- HP flash line to NH3 line Japanese valve reconditioned.
	- NH3 line to Autoclave Taylor valve gland replaced.
	- Both discharge valve of Ammonia pump P-1102/A replaced
	- 60 ata steam header GHH compressor drain valve trap replaced.
	- FRCV-1201 replaced spindle and bush of valve.
	- Steam tracing to carbamate overflow line 3 Isolation Valves gland packing replaced.
	- 60 ata to Q-1101 isolation valve new gasket and gland packing replaced.
	- 9 ata steam tracing to V-1201 main I/V gland packig replaced.
	- Steam tracing V-1203 of I/V gland packing replaced.
	- PRCV-1501 ent I/V gland replaced.

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CODE NO	JOB DESCRIPTION
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- V-1501 level glass P.T side top I/V gland replaced.
- Steam injection to HICV-1201 I/V gland packing replaced.
- Steam injection to RV-1201 I/V gland packing replaced.
- Both R.V of 4 ata steam drum checked by boiler inspector in workshop. Set pressure 7.5 kg/cm2.
- H-1202 Ammonia to condenser Taylor valve gland replaced
- Ammonia vent valve replaced (300 #) near M.O.V. at first floor.
- M.O.V. valve CO2 strippr - Repacked gland packing.
- CO2 strippr NRV - Plug seat of valve machined and lapped.
- 4 ata steam actuator valve of pignon Turbine overhauled.

02 19 01 AUTOCLAVE V-1201 LEAKAGE :

Plant stopped at 3.00 PM on 13.06.96 due to leakage observed in Autoclave (Scrubber overflow line to Autoclave Bottom) bottom nozzle No.C-5 from wheephole.

After checking the leakage it was decided to stop the plant for repairing the leakage. Following steps were taken during repairing.

01) Drained the high pressure system. flushed with DM water

02) DISMANTLING JOBS :

Made arrangement for manway opening and work started on 14.06.96 at 13.0 hrs. Top cover lifted by chain block at 16.00 hrs. Removed 2" drain valve bonnet of Autoclave drain and arranged hose connection for Autoclave cooling.

Temperature was 100 deg.C inside Autoclave to reduce temp. Started D.M.water spraying. WE got vessel entry permit at 7.30 PM on 15.06.96. at that time temp. was 50 deg.C. After removing 1st (top) tray suddenly hot vapour came out and also air supply stopped so it was very difficult to stay inside and job re-started at 9.15 PM and removed all ten trays upto 2.30 AM. Autoclave handed over to inspection department at 3.0 AM on 16.06.96.

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CODE NO	JOB DESCRIPTION
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03) INSPECTION OF BOTTOM AREA & WELDED NEW LINER :

The details of inspection observations and the repairs carried out are described under inspection section report at 02 41 01

04) FINAL BOXED UP :

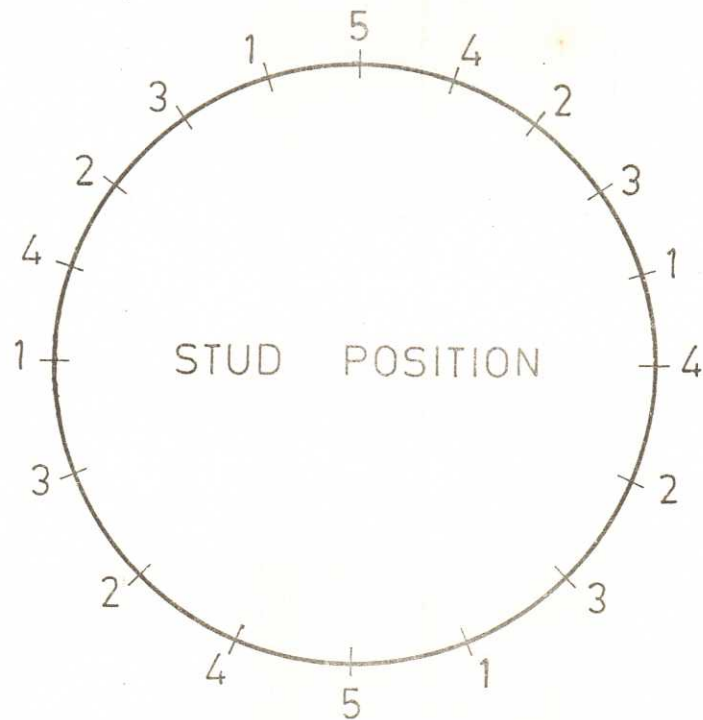
Repair and Inspection completed at 1.00 PM on 23.06.96.  
Tray fixing started at 2.30 PM.

- Started box up from bottom tray & replaced missing bolts.
- During boxed up all bolts tighten and checked carefully.
- All ten trays boxed up at 10 PM
- New SS (Khemchand) gasket placed on top manway.
- Top cover of Autocalve lifted and put in position.
- After manual tightening of the nut, hydraulic jack applied.
- Firstly 200 kg/cm<sup>2</sup> gauge pressure taken and all stud tighten.
- After tighten upto 200 kg/cm<sup>2</sup>, checked gap between top cover flange and shell top found nearly equal then 350 kg/cm<sup>2</sup> hydraulic pressure applied.
- After checking gap again hydraulic pressure maintained 450 kg/cm<sup>2</sup> and tighten all stud. All stud re-checked at same pressure.
- After tighten all stud, taken gap between top cover and shell found equal. (Refer FIGURE : 1)
- Job is completed

02 19 02 STEAM CONDENSATE TANK T-1501 :

- Foundation repaired.
- Internal patch plate provided by workshop.

FIGURE : 1  
JUNE - 1996



- ① 200 KG / CM<sup>2</sup>
- ② 350 KG / CM<sup>2</sup>
- ③ 450 KG / CM<sup>2</sup>
- ④ 450 KG CHECK

STUD POSITION AUTOCLAVE (V-1201)

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CODE NO            JOB DESCRIPTION  
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02 19 03    2ND EVAPORATOR FIRST CONDENSER H-1425 :

- Top channel cover bolts removed.
- Hydrojetting was done and boxed up.
- Second evaporator to first condenser line opened and replaced new gasket.

02 19 04    FLASH TANK H-1421 :

- Top cover opened.
- Hydrojetting was done and boxed up.

02 19 05    LIQUID NH3 PREHEATER H-1102 :

- Hydrotest performed. It was found leakage in three tubes
- Three tubes were plugged and boxed up.

02 19 06    HYDROJETTING OF HEAT EXCHANGERS/COOLERS

- 1) Surface Condenser H-1114.
- 2) Crank case lube oil Cooler H-1123.
- 3) Recirculation Heater H-1204.
- 4) Flash tank condenser H-1421.
- 5) First evaporator H-1422.
- 6) Second evaporator H-1424.
- 7) Second evaporator 1st Condenser H-1425.
- 8) Urea Solution heater H-1422-A.

02 21 01    CONVEYOR BELTS :

01)    M-1401

- Adjusted scrapper blade height of 5 Blades.
- Aluminium seat put over scrapper arm for trial.

02)    M-1703

- All three Rotary valve were cleaned by water and visually inspected. It was found that one valve (on maint.urea side) blades and teflon seat badly damaged.

CODE NO	JOB DESCRIPTION
	<ul style="list-style-type: none"> <li>- Blades were straightened.</li> <li>- New teflon seat put.</li> <li>- Bearings clearance was within limit.</li> <li>- Finally boxed up.</li> </ul>
03)	<u>M-1421</u> :
	<ul style="list-style-type: none"> <li>- Removed damaged portion of belt &amp; provided 4.0 Mtr. new belt.</li> <li>- Vulcanizing job completed.</li> </ul>
04)	<u>M-1403</u>
	<ul style="list-style-type: none"> <li>- Firstly cut 2 mt. length from old belt.</li> <li>- Vulcanizing of 5.2 mtr. (4 + 1.2 mt for overlap) belt was done.</li> </ul>
05)	<u>M-1419</u>
	Replaced by new belt and vulcanizing done.
02 23 01	<u>MISCELLANEOUS JOBS</u> :
	<ul style="list-style-type: none"> <li>- 4 Ata header orifice flange boxed up with machined orifice plate and provided new gasket and new studs.</li> <li>- V-1501 level glass P.T. side top I/V gland replaced.</li> <li>- Carbamate line steam tracing flange gasket replaced.</li> <li>- FICV-1204 coil replaced.</li> <li>- Tracing of FRCV 1202 d/s line, "T" joint hole leak repaired.</li> <li>- H-1207 cooling water strainer opened and cleaned.</li> <li>- H-1203 Carbamate drain line flange joint refixed.</li> <li>- P-1113 A/B lub oil suction strainer opened and cleaned.</li> <li>- PCS (Prill cooling system) End pulley bearings greased. alignment of gearbox to head end pulley coupling is done.</li> </ul>

\*Noted ✓

\*Noted ✓

\*Noted ✓

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 CODE NO            JOB DESCRIPTION  
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- BFW pump P-1501 bearing changed and alignment work is completed.
- |          |          |          |
|----------|----------|----------|
| - 0.001" | 0.00     | - 0.002" |
|          | - 0.003" |          |
- Replaced tracing line changed around 10 mtr at prill tower top due to old one corroded.
  - Checked oil level of hydraulic coupling for M-1402 scrapper.
  - Balancing line of CO2 to stripper line 1st isolation valve (Taylor) replaced.
  - Conveyor belt of prill cooling system-Made arrangement for oil indicator.
  - Off gas line Autocalve (V-1201) to H-1203 Scrubber (just below Scrubber) Gasket lapped and wrapped teflon tape.
  - V-1203 replaced broken level glass of 9 ata.
  - H-1203 Carbamate drain line flange joint repaired.
  - Provided new connection in condensate line at 1st floor for conductivity measurement.
  - Nearly 60 Traps were changed in stream line which were supplied by Forbes Marshall. These traps are Balanced pressure Thermostatic type.



PLANT TURNAROUND - 1996UREA PLANT

65

INSPECTION JOBS

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CODE NO	JOB DESCRIPTION
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02 41 01 Urea Plant was required to be stopped as leakage from the Autoclave bottom dished end liner weep holes was observed on 12.6.96. In order to locate the leakage point and to rectify the same, various tests were carried out. Also, other equipments were visually inspected and attended during this Shutdown. Repairs on Condensate Tank T-1501 Replacement of Carbamate Pump-B discharge line segment were among the other major jobs taken during this Shutdown. The details of inspection activities carried out during this Shutdown are described below:-

(A) AUTOCLAVE V-1201:

On 12th June 1996, a leakage was observed in the Autoclave liner leading to some ammonia gas coming out through the weep holes of bottom hemispherical dome. After confirming that the leakage is through bottom hemispherical dome only, it was decided to detect and repair the same. The various inspections jobs carried out are as under :-

1. Visual inspection of the liner and its weld.
2. Soap solution - air test.
3. Dye Penetrant test.
4. Ammonia test.
5. Confirmatory soap solution air test and ammonia test after repairing jobs.

PRE-INSPECTION ACTIVITIES:

Before starting the inspection job, the annular space between the liner and the shell in the bottom dome was flushed with condensate at 0.2 kg/cm<sup>2</sup> to remove any probable accumulation of the Urea-Carbamate in the annular space. Also the annular space was repeatedly evacuated with the vacuum pump so that while cooling of the vessel any entrapped urea carbamate does not solidify.

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CODE NO            JOB DESCRITPION  
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1.    VISUAL INSPECTION:

After opening the vessel, a very close visual inspection of the bottom hemispherical weldjoints was carried out to find any point of leakage. but no apparent point of leakage was observed.

2.    COMPRESSED AIR - SOAP SOLUTION TEST:

The annular space between liner and shell was then pressurised through weep hole with compressed air at 0.2 kg/cm<sup>2</sup> and all the weld joints inside including the circumferential seam of the Dished end liner to cylindrical shell liner were tested by application of soap solution made in D.M. water.

No sign of leakage from any weld joints could be traced out and hence, this test was repeatedly done but no positive indication of leakage could be located.

In absence of any indication of leakage in soap solution-air test, it was decided to do D.P. test of all the weld joints of bottom hemispherical end.

3.    DYE-PENETRANT TEST:

D.P. Test of all the weld joits of bottom hemispherical end was carried out. Results of the D.P. test had revealed a number of small indications of surface flaws at the weld seams and also in the heat affected areas of the weld joints. All these surface defect locations were marked and individually repaired by welding if needed. then again all repaired spots were D.P. tested.

However, in D.P. testing a small pinhole/crevice was observed on weld edge of liner to the cover plate provided on the west side weld joint of the central circular liner segment (crown plate). On close observation of this, it was observed that there is a large crevice between the cover plate and bottom liner plate as about 6" long thin wire was penetrating inside through the opening.

Soap solution air test was carried out again to confirm any leakage through this opening but no leakage could be detected.

Thickness measurement on the coverplate was carried out and it was found that the 6 mm thick cover plate was thinned down to 1.5mm from the inside near the area of crevice.

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CODE NO	JOB DESCRIPTION
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So it was decided to replace this cover plate by new one. The complete repair procedure for bottom dished end liner was prepared in consultation with M/s.L & T Engineer. The procedure is described below.

- 1) Remove corroded portion of crown (bottom D/E) by grinding.
- 2) Remove old weld metal/old liner on crown c/s. towards crown plate side . as shown in the FIGURE : 2.
- 3) After removal of the corroded portion of the liner. thickness of dished end in the corroded area to be checked by UT. clear DPT. of D/E in the corroded portion to ensure soundness of the material.
- 4) Fabricate insert liner plate (urea grade 316L) of 6 MM thick to suit the cavity created by removal of the liner. At the boundary of insert liner and old liner. there should not be gap of more than 0.5 MM to 1.0 MM.  
  
Make w.e.p. on the edge of insert piece and old liner as shown in FIGURE : 3  
  
Insert strip fit-up near backing strip (Section S1-S1) is to be as shown in FIGURE : 4
- 5) New insert liner fit-up is to be checked by inspection staff before seal welding.
- 6) Weld the insert liner to old liner by GTAW process using thermanite 25/22H/Sandvik 25.22.2 LMn filler wire. This welding is to be done in two pass. Starting and ending point of the two passes should not be in one location. Clear DPT of two pass. One inch length is to be left unwelded.
- 7) Grind off reinforcement of weld for better fit-up of cover strip. Clear DPT after grinding.
- 8) Corroded portion of the liner to be filled-up and DPT cleared before the cover-strip fit-up.
- 9) Cover strip is to be more wider than insert strip by 12 MM (1/2 inch). There should not be any gap between cover strip and insert strip/liner.
- 10) Weld cover strip to liner by GTAW process in minimum two pass. using thermanite 25/22H/Sandvik 25.22.2 LMn filler wire. Starting and ending point of two passes should not be at the same location.

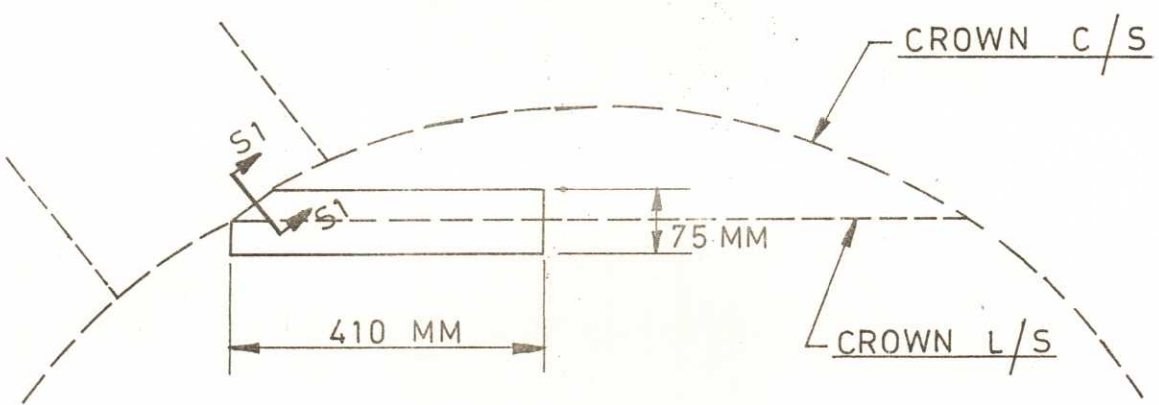
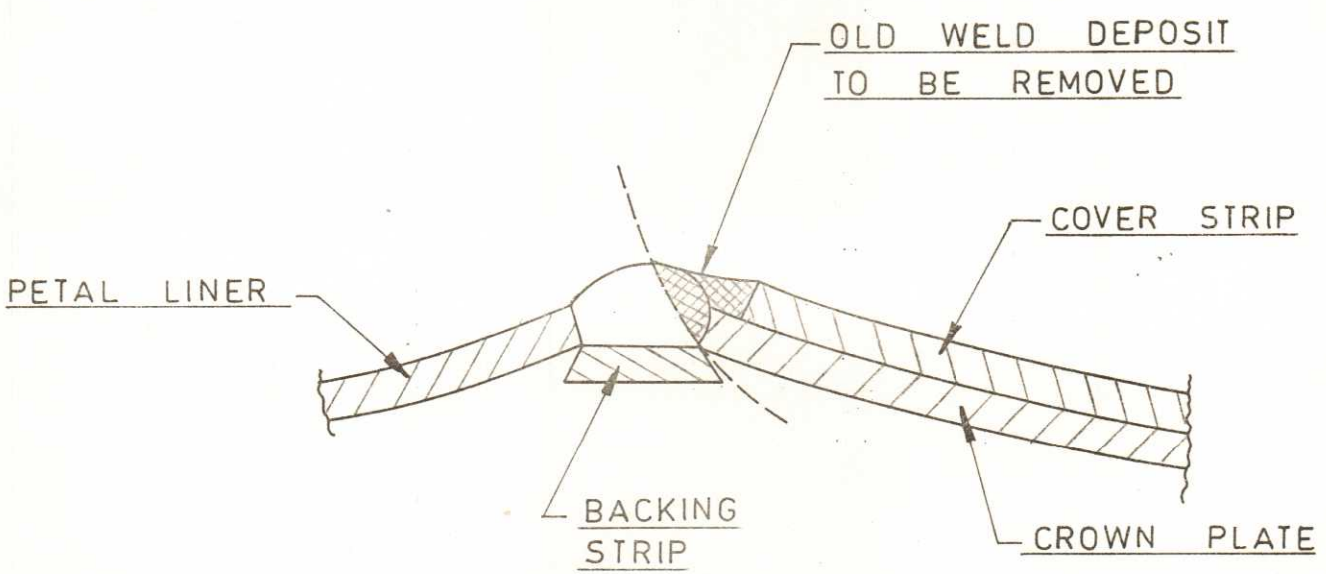


FIGURE : 1



SECTION : S1 - S1

FIGURE : 2

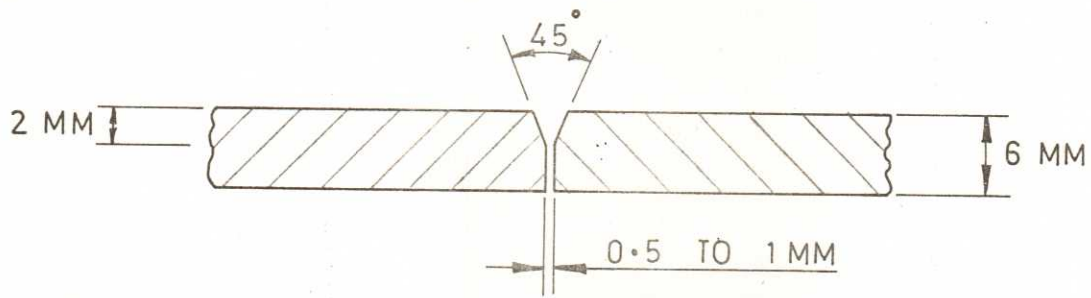
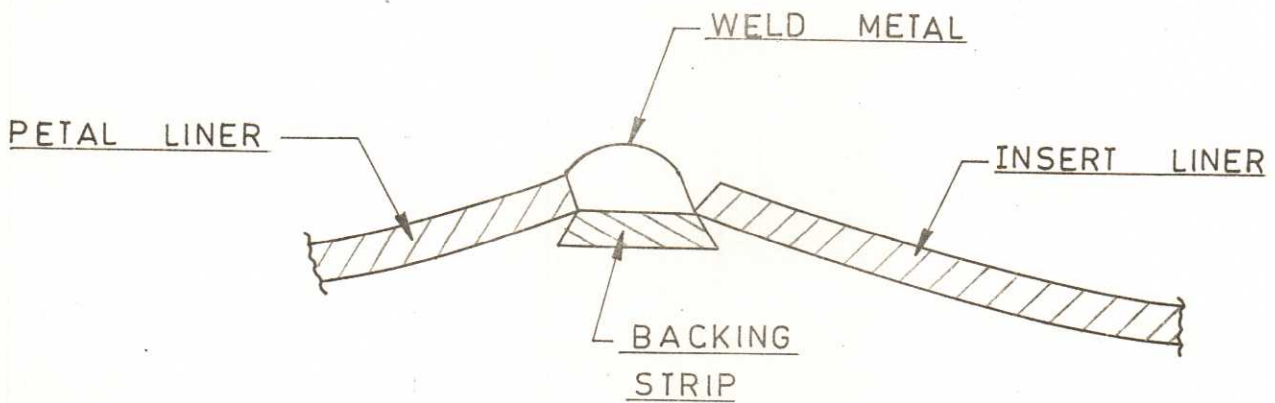


FIGURE : 3



SECTION : S1-S1

FIGURE : 4

CODE NO	JOB DESCRIPTION
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- 11) Argon purging is to be done in the space between liner and dished end during and 30 minutes before start of welding. (Argon flow at the rate of 5 LPM at 0.2 Kg/cm<sup>2</sup>)
- 12) Section S1-S1 after repair welding will be as shown in FIGURE : 2
- 13) DPT defects in other locations to be weld repaired by shallow grinding after clearing DPT.
- 14) All welds in contact with process fluid to be left un-ground in the as welded condition.
- 15) Clear DPT. air and soap solution test and finally ammonia leak test.

Accordingly the welding of cover plate was ground off and cover plate was removed. On removal of cover plate it was observed that a unmatched gap of about 3 mm was left out between the liner and cover plate in a length of about 30 inch. Also the liner below the cover plate was found badly corroded, so again soap solution air test was carried out to check whether any leakage through this area, but no leakage was observed through the corroded area of liner plate.

Then it was decided to cut off this corroded portion ( 3" x 14") of the liner plate and replace it with new 5 mm thick SS 316L segment with new cover plate. While fitting the new liner plate the level of insert piece was found down as compared to the remaining liner plate by approx. 4 to 5 mm. This was due to the original gap left out during fabrication between the liner plate and pressure shell. The difference in level was made up by weld deposit on insert plate using Thermanit 19/15 H electrode. After uniform grinding of the weld deposits, DP test and ferrite measurement was carried out which showed satisfactory results. Finally cover plate having approx. 15mm overlap on all the sides of the insert liner segment was placed in position and seal welded with GTAW process using Sandvik 25-22-2 LMn filler wire.

The seal welding was inspected by DP test and ferrite measurement after root run and final welding. No ferrite was found in the weld and also joint was found defect free in D.P. test.

**4. AMMONIA TEST:**

After completion of all repairs on the defect indications observed under visual and DP test, ammonia test was carried out as follows.

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CODE NO	JOB DESCRIPTION
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The annular space was first purged with nitrogen for one hour then the space was evacuated by running a vacuum Pump. Then Ammonia gas was admitted in to the annular space of bottom dished end through the weep hole at 0.2 kg/cm<sup>2</sup> pressure. In the meantime after thorough cleaning of the liner surface, ammonia sensitive paper was applied on the liner weld as well as on all the nozzle welds. Application of ammonia sensitive paper was made under extremely low illumination and with proper care to avoid any possible displacement of paper. The ammonia was kept charged for a period of twelve hour.

The result of the ammonia test revealed a blueish colouration on the paper at the Liquid Carbamate Inlet Nozzle weld joint with liner.

The defect spot was physically discovered by magnifying glass with a great difficulty to be a small crater and a very small pinhole closer to it.

Finally, rectified the same with GTAW process using Sandvik 25-22-2 LMN filler wire. The root run and final welding was inspected by D.P. test and ferrite measurement. No ferrite was observed in the weld and also the joint found free from defect in D.P. test.

After completion of the repair weld, air and soap solution test followed by the confirmatory ammonia leak test was carried out as per the previous procedure. No indication of leakage was observed in both the tests.

The repair weld joints were then passivated using solution of Nitric acid and Hydrogen Peroxide and were finally rinsed with D.M. Water to avoid accumulation of acidic solution, if any.

**(B) INSPECTION OF VESSLES:**

The following vessels and tanks were opened and offered for inspection. The visual inspection and thickness measurement etc., were carried out.

**(a) AUTO CLAVE V-1201:**

Alongwith the maior repair weld on the bottom hemispherical end, visual inspection and ultrasonic thickness measurement of the liner of all the compartments was carried out.

During the visual inspection, about seventeen spots were marked on the welds/heat affected area of the liner which were found to have pinhole/crevice like defects. The same were repaired by grinding and welding followed by DP test and ferrite measurement.

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CODE NO	JOB DESCRIPTION
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The insert liner plates were found heavily corroded and wall thickness reduction has been observed. The thickness measurement report of liner is attached herewith.

Also thickness measurement of the bottom hemispherical end was carried out from outside after removal of insulation. Report is attached herewith.

**b) FIRST STAGE EVAPORATOR SCRUBBER V-1423:**

1. Minor pittings were observed on tray support welding in scattered area.
2. The inside surface of the vessel was observed brownish in colouration.
3. Demister pad segment one no. was found displaced and its holding bolts were found loose. Informed the same to Shift Engineer for necessary action.
4. Ultrasonic thickness measurement was carried out. the results are attached.

**c) 4 ATA STEAM DRUM V-1501:**

1. Condition of the demister pad was good.
2. Scattered shallow pittings were observed on both the dished ends.
3. The colouration of vessel inside surface was observed to be blackish.
4. Ultrasonic thickness measurement of the vessel was carried out. A report is attached herewith.

**d) SECOND STAGE EVAPORATOR H-1424:**

1. The shell inside had assumed brownish black colouration.
2. The overall condition of the vessel internal was found satisfactory.
3. Ultrasonic thickness measurement of the vessel was carried out. A report is attached herewith.

**e) CONDENSATE TANK T-1501:**

1. The colouration of the tank inside was observed to be blackish.
2. Condition of demister pad was found satisfactory.



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 CODE NO                      JOB DESCRIPTION  
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3. A 10-12 inch long crack alongwith few minor cracks was observed near the South end of the tank saddle support plate provided on east side. Similarly, crack was observed near the north end of the saddle support plate provided on west side.
4. Repaired the cracks on both the side by grinding and welding and also a patch plate was provided from inside on the bottom segment of tank at the area of both the saddle plate support for extra reinforcement. All the welding joints were inspected by D.P. Test.
5. Ultrasonic thickness measurement of the tank was carried out. Report is attached herewith.

C) ULTRASONIC THICKNESS MEASUREMENT OF FOLLOWING PIPELINES WERE CARRIED OUT.

Sr.No.	Line No.	Size	Sr.No.	Line No.	Size
1.	SC-1233/36	12"	11.	PR-1204	8"
2.	SC-1237/44	16"	12.	PR-1205	6"
3.	SC-1501	4"B4	13.	PR-1208	4"
4.	SC-1502	3"	14.	PR-1212	4"
5.	SC-1504	4"B4	15.	PR-1219	8"
6.	ST-1106	14"-B4	16.	PR-1223	4"
7.	ST-1209	3"	17.	PR-1224	3"
8.	PR-1201	8"	18.	PR-1225	3"
9.	PR-1202	10"	19.	PR-1230	6"
10.	PR-1203	8"			

D) MISCELLANEOUS JOBS:

- 1) Carbamate Pump (P-1201-B) discharge line short loop between the common T-Joint and down stream of isolation valve at first floor was replaced by new one.

Inspection of the edge preparation, root run welding and final welding was done by D.P. test and ferrite measurement. The test results were found satisfactory. Finally all the three nos. of field weld joints were radiographed and the same were found satisfactory.

- 2) During the ultrasonic thickness measurement of Condensate Pipeline (SC-1504-4"-B4) from 9 ata steam drum (V-1503) to 4 ata steam drum (V-1501) thickness reduction of 33% to 40% was observed on the elbow and horizontal pipe piece in the U/S of control valve at 4 ata steam drum. So it was decided to replace the elbow and pipe line segment by new one.

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CODE NO            JOB DESCRIPTION  
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Edge preparation for the weld joints root run and final welding joint were inspected by D.P. test. Finally radiographic inspection of all weld joints were carried out for confirming the soundness of the joint.

PLANT TURNAROUND - 1996

75

UREA PLANTCIVIL JOBS

<u>CODE NO</u>	<u>JOB DESCRIPTION</u>
02 51 01	(01) Epoxy painting work on R.C.C. walls of prilling room. Pramotograph room. Lift cabin R.C.C. columns and beam of Prill Tower.
	(02) Epoxy chequard painting of outer face of Prill Tower (Top partition)
	(03) Epoxy painting of scrapper floor wall, conveyor gantry M-2110, M-1419, M-1421 and R.C.C columns foundation of Urea plant.
	(04) Dismantling existing damaged concrete and re-casting the foundation of condentiones at First floor of Urea plnat.
	(05) Acid / Alkali proof brick line repairs of scrapper floor.
	(06) Making pocket for fixing conveyor belt and cables and grounting the same in Prill Cooling System.
	(07) A.C sheet fixing on extended portion of P.C.S. and veritical clading at second floor of P.C.S.

PLANT TURNAROUND - 1996

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UREA PLANTELECTRICAL JOBS

CODE NO	JOB DESCRIPTION
02 61 01	(01) Carried out cleaning & painting of TR-7A and TR-7B.
	(02) Carried out preventive maintenance of TMG L.T. ACBs installed in MCC-6. <ul style="list-style-type: none"><li>(a) Cleaned the contacts and mechanism.</li><li>(b) Checked contact pressure and adjusted.</li><li>(c) Lubricated the mechanism and all the moving parts.</li><li>(d) Checked tripping and closing timing for uniform opening and closing of poles.</li></ul>
	(03) Preventive maintenance carried out on MCC-6. All feeder compartments were cleaned and checked.
	(04) Replaced cable lead of Y-phase of AMF set feeder (feeder no. 33) compartment.
	(05) Carried out retermination of incoming cable of Y-phase on MCC side.
	(06) Carried out recrimping of cable connector of P-1202A & P-1202B motor feeder compartments.
	(07) Checked & cleaned all push button stations for proper operation and replaced wherever found corroded.
	(08) Carried out overhauling of following motors : <ul style="list-style-type: none"><li>(a) P-1408</li><li>(b) P-1505A</li><li>(c) P-1401A</li><li>(d) replaced M-1401B motor with indigenous motor.</li></ul>
	(09) Modification in grill cooling system : <ul style="list-style-type: none"><li>(a) Disconnection, rerouting and connecting of cables of belt conveyor, rotary valve (3 Nos.) and agitator motor.</li><li>(b) Laid power &amp; control cables and connected for screw conveyor motor.</li></ul>

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CODE NO            JOB DESCRIPTION  
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- (c) Carried out modification on feeder compartment in MCC-14 for Forward-Reverse system for screw conveyor.
- (d) Rerouting of all cables on modified cable tray in PCS to accommodate screw conveyor.
- (e) Replaced existing TPW flourescent tube fittings with well glass 160 W fittings to improve illumination.
- (10) Checked, cleaned and adjusted limit & torque switches of all Motor Operated Valves as per production requirement.
- (11) Provided Star-Delta starter and connected for portable Vaccum Blower.
- (12) Carried out modification on feeder compartment in MCC-8 for providing alternative power supply to brill tower lift during shut down.
- (13) Checked & cleaned Rope switches of M-1403, M-1419 & M-2110 conveyors.

In addition to above jobs, provided connections to Hydrojetting machine, vacuum blowers, flood lights, hand lamps, telephone connections, etc., as per requirement during shut down.

PLANT TURNAROUND - 1996

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UREA PLANT

INSTRUMENT JOBS

CODE NO	JOB DESCRIPTION									
02 71 01 (1)	LCV-1301 Valve  The body was leaking. Removed it from the line and found there is erosion from inside of the body. Filled 316SS material through the inner surface and machined for the gasket area and put it in line.									
(2)	HICV-1421 Valve  The valve opened for inspection. The Teflon sleeve were found damaged. Replaced by a new one and put the valve in line.									
(3)	Stroke checking of the following valves were carried out.  <table border="0"> <tr> <td>i) HICV-1201</td> <td>ii) HICV-1202</td> <td>iii) LRCV-1201</td> </tr> <tr> <td>iv) FR 1-1</td> <td>v) HICV-1121</td> <td>vi) LCV-1501</td> </tr> <tr> <td>vii) HICV-1122</td> <td>viii) HICV-1022</td> <td>ix) PRCV-1201</td> </tr> </table>	i) HICV-1201	ii) HICV-1202	iii) LRCV-1201	iv) FR 1-1	v) HICV-1121	vi) LCV-1501	vii) HICV-1122	viii) HICV-1022	ix) PRCV-1201
i) HICV-1201	ii) HICV-1202	iii) LRCV-1201								
iv) FR 1-1	v) HICV-1121	vi) LCV-1501								
vii) HICV-1122	viii) HICV-1022	ix) PRCV-1201								
(4)	Gland packing cleaning of the following control valves were carried out.  <table border="0"> <tr> <td>i) LCV-1501</td> <td>ii) FRCV-1421</td> <td>iii) HICV-1201</td> </tr> <tr> <td>iv) PRCV-1502B</td> <td>v) FICV-1325</td> <td>vi) LICV-1352</td> </tr> <tr> <td>vii) LCV-1123</td> <td></td> <td></td> </tr> </table>	i) LCV-1501	ii) FRCV-1421	iii) HICV-1201	iv) PRCV-1502B	v) FICV-1325	vi) LICV-1352	vii) LCV-1123		
i) LCV-1501	ii) FRCV-1421	iii) HICV-1201								
iv) PRCV-1502B	v) FICV-1325	vi) LICV-1352								
vii) LCV-1123										
(5)	Positioner and air regulator cleaning were carried out for the following control valves.  <table border="0"> <tr> <td>i) HICV-1202</td> <td>ii) PRCV-1201</td> <td>iii) HICV-1201</td> </tr> <tr> <td>iii) LRCV-1201</td> <td>iv) FRCV-1352</td> <td></td> </tr> </table>	i) HICV-1202	ii) PRCV-1201	iii) HICV-1201	iii) LRCV-1201	iv) FRCV-1352				
i) HICV-1202	ii) PRCV-1201	iii) HICV-1201								
iii) LRCV-1201	iv) FRCV-1352									
(6)	FRCV-1201  Overhauled the complete valve.									
(7)	Actuator diaphragam of the following control valve were carried out  <table border="0"> <tr> <td>i) LRCV-1201</td> <td>ii) FICV-1352</td> </tr> </table>	i) LRCV-1201	ii) FICV-1352							
i) LRCV-1201	ii) FICV-1352									
(8)	FRCV-1421 valve  Opened for the improper travel due to material deposition. Cleaned the plug and seat and removed all the deposited material and put in line.									

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CODE NO                      JOB DESCRIPTION

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(9) PICV-1501 valve

New plug and seat provided and the hydro test were carried out for passing upto 200 Kg/cm<sup>2</sup> and found OK. Put it in line.

(10) The following switches were overhauled and calibrated.

i) LLA-1123	ii) PHCO-1126	iii) PHA-1124
iv) PHCO-1127	v) PLA-1145	vi) PLCO-1145
vii) PLCO-1153	viii) PHCO-1132	ix) PLCO-1124
x) PLCO-1163	xi) PL-1167	xii) PLCO-1167
xiii) PLCO-1166	xiv) PLCO-1160	xv) PHCO-1133
xvi) PHA-1133.		

(11) The following switches were replaced by new.

Prill divert switch.

(12) LR-1201

Removed and put back radio active source from the source holder on location and kept in the source container to facilitate vessel entry by prdn..mech..insp. people.

(13) Autoclave

Provided and arranged PI Gauges, tubing, fittings, regulators, etc. time to time for leak testing by insp.. mechanical. prod. people through weep-hole by injecting steam, Nitrogen, Air and NH<sub>3</sub>, etc. One person was made available round the clock for this purpose, till the job was completed by maint. / insp. people. Also after plant start up necessary arrangement was made to help prdn. people for confirming that there was no leak as autoclave was on stream.

(14) Compressor House

Worked with mech. maint people to facilitate their job by removing T/C. Vibration probes, pi gauges, etc and then refixing when their job was over.

(15) Conductivity Meter

- a) Sample cooler of conductivity meter for condensate to Offsites was cleaned.
- b) New sample point taken for H-1202 4 ata conductivity sample.

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CODE NO                      JOB DESCRIPTION

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(16) Leveltrols

The following leveltrols of the steam drums and surface condensor were cleaned/overhauled and calibrated.

- a) LC-1123                      b) LC-1501                      c) LC-1502
- d) LC-1503                      e) LT-1235

(17) TR-1206

The thermowells of autoclave were inspected for erosion and found that the thermowell for TR-1206 point was eroded at the tip. Replaced with a new spare thermowell.

(18) New Dust Dissolving Tank

Following erection/inst. installation job were carried out:

- a) Thermowell fixing socket was welded and the thermowell was fixed in the socket.
- b) Instrument/air regulator mounting stand/arrangement was fabricated and welded in position.
- c) Air header for inst. air supply was fabricated with necessary air isolation valve for individual regulator.
- d) Temperature controller, air regulators, receiver switch for level alarm of the tank, receiver gauge for local indication of level, were fixed on mounting stand.
- e) S.S. tubing was done for air supply to the level trans. and temp. controller, and out put of these instruments.
- f) 2 core armoured cable was laid up to c/r panel ann. box for level alarm of the tank.

(19) The following control loops were attended for the job described below :-

- a) Transmitters were completely overhauled along with air header, etc.
- b) Control valve.. V/P & Air reg were overhauled, stroking carried out. C/V painted and covered with pvc sheet.

- 1) PIC-1207    2) LIC-1235    3) HIC-1202    4) PRCV-1201



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CODE NO	JOB DESCRIPTION
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(20) The following Transmitters were attended for the job described below:-

a) Transmitters were completely overhauled along with air header.etc.

b) Local PI also were calibrated.

1) PIC-1202      2) LIC1201.

(21) Following d/p tx. manifolds were replaced by new ones as the old one were leaky or jammed or not working.

i) FRC-1302

ii) FR-1504

iii) FE-1502

(22) ISO 9002 Quality affecting instruments

All the instrument declared as quality affecting instruments for ISO 9002 were calibrated and appropriate record was also generated.

(23) Control Room Panel

All the instruments mounted on control room panel were calibrated.

(24) Battery charger/UPSS

a) Carried out discharging of batteries by putting total load on UPSS and then charging by transferring load on UPSS by switching on mains.This exercise was carried out five times.

b) The UPSS/Battery charger were shifted on mounting stand and its position was turned by 90 deg.angle from facing to main door.

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PLANT TURNAROUND - 1996

UREA PLANT

TECHNICAL JOBS

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CODE NO	JOB DESCRIPTION
02 81 01	(01) Modification of Urea Dust Dissolving in Prill Cooling System.
	(02) Installation of additional RV on V-1103
	(03) Tapping of 4 Ata steam for steam line to RVs & LPCC. Off-gases on Line No. ST-1506-18"-B4.

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## PLANT TURNAROUND - 1996

P3

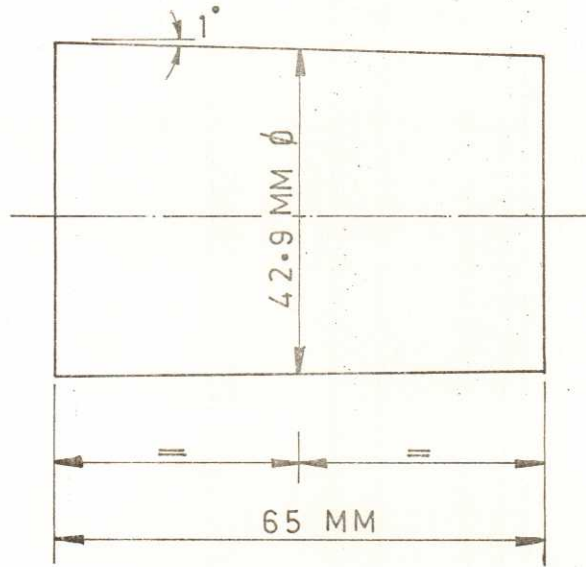
## OFFSITE

## MECHANICAL JOBS

CODE NO	JOB DESCRIPTION
03 02 01	<u>F.D.FAN K-5113 :</u>
	i) Oil cooler cleaned from water side.
	ii) Deplex filter cleaned. Clutch oil changed.
	* <u>Noted</u> iii) Relief valve of exhaust side (4 ata) of F.D.Fan turbine was overhauled as it was passing. It was tested at popping pressure of 4.4 kg/cm <sup>2</sup> and reset pressure of 3.96 kg/cm <sup>2</sup> .
03 02 02	<u>BFW PUMPS P-5111 <del>A/B</del> :</u>
	* <u>Noted</u> i) Grease of the gear coupling was top up in turbine driven pump.
	ii) Oil coolers with oil storage tank (both) cleaned.
03 14 01	All STEAM LEAK jobs are attended as per shutdown job list.
03 15 01	<u>BHEL BOILER INSPECTION F-5111 :</u>
	i) Boiler inspection done. Open inspection done on 18.06.96 and hydrotest was witnessed by boiler inspector on 24.06.96. Hydrotest pressure was 88.5 Kg/cm <sup>2</sup> as advised by Boiler inspector.
	* <u>Noted</u> ii) One tube found leak. A pin hole was observed in one tube of furnace wall North side (i.e. boiler control room side) in second No. tube row No.C-1, BW2. The tube was plugged at both ends. The plug size is shown in FIGURE : 1
	iii) Bottom 6" Gas gun tip (code No: 35808019) of BHEL boiler was changed with new as the old was badly burnt. Expansion bellow inside was also found damaged. This was made from flexible metallic hose and installed.
	iv) An opening of frame and cover on the hot air duct top side was made near RAH in consultation with BHEL Engineer to facilitate the hot end basket directly inserting in the rotor directly.

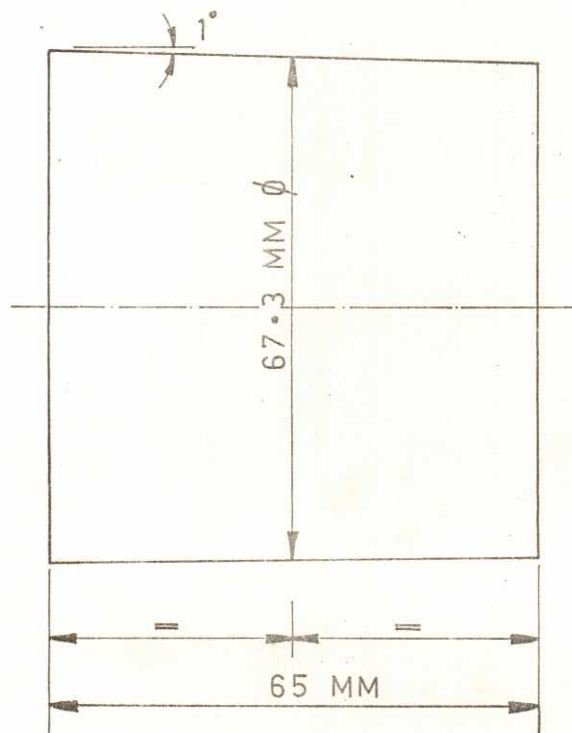
FIGURE : 1

①



MUD DRUM SIDE

②



STEAM DRUM SIDE

\* *Alsteel*

PLUG FOR BHEL BOILER (F-5111)

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 CODE NO                      JOB DESCRIPTION  
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- v) Flue gas leakage was observed in the duct of flue gas to RAH unit. On opening a through crack round the periphery of the duct near expansion joint was observed. This was repaired by welding and new insulation was done.
- vi) RAH washing drain line rerouted.
- vii) An opening with cover provided in flue gas outlet duct for better cleaning of bank tubes of the BHEL boiler.
- ix) Dearator level gauge glass (top) gasket leak attended.
- xi) RAH buckets checked and found okey.
- xii) Common dempers of primary and secondary air and RAH inlet / outlet dampers are checked and found okey. All end bearing covers opened and greasing done.

**03 15 02 BHEL BOILER F-5111 :**

- 1) All the three safety valves (Drum front R.V Drum Rear RV. and Superheater Valve) are overhauled and boxed up.

Valve seat (Disc) replaced in Drum front end R.V.

All three safety valves tested on 01.07.1996 and their pressure setting readings are as under.

\* Noted

	Popping pressure ( Kg/cm2 )	Reset pressure (Kg/cm2)
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Drum front R.V	71.5	67.00
Drum Rear R.V	69.0	66.00
Superheater R.V	64.5	61.50

- 2) Blind flange provided in flue gas sampling isolation valves before and after R.A.H.

Flange size : 4" dia N.B Blind flange 150 class.

- 3) B.F.W line drain near pipe rack was replaced with two Nos isolation valves.

Pipe size : 2" dia N.B C.S. pipe Sch.80  
 Valve size : 2" dia N.B Bonnetless globe valve (BHEL Make)

Rating : 1500 class  
 End connection : Socket weld

Welding : E-7018 (Supertherm)  
 Electrode

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CODE NO                      JOB DESCRIPTION

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- 4) Provided new connection for R.A.H bearing cooling water line for hose connection.

Size : 3/4" dia N.B pipe with isolation valve

Valve : 3/4" dia N.B. Gate valve 600 class

- 5) Isolation valves of C.B.D.tank direct level gauge glass overhauled and its level gauge glass to be replaced.

03 19 01 RAW WATER INLET LINE FOR RAW WATER TANK :

- i) New C.S.distance piece provided in Raw water inlet line for flow measurement.

Distance piece length : 1 Mtr.

Pipe size : 20" dia N.B C.S.pipe Sch. 40

Flanges : 20" dia N.B S.O.F.F. 150 #

- ii) F.R.P inlet line (20" dia) flange joint was done.

03 31 01 COOLING TOWER :

- i) Corroded overflow line of Ammonia side basin sump was replaced.

Pipe size : 12" dia N.B pipe Sch. 40

- ii) Cooling water return line distribution header

Following size of patching work provided in cooling water distribution header of Ammonia Cooling Tower.

A-2 : 36" dia pipe size - Ammonia side wooden support area (750mm x 750 mm)

A-2 : 36" dia pipe size - At the bottom half of distribution valve (Ammonia side) (1.5 Mtr. long)

A-5 : 28" dia pipe size - At the bottom half of distribution valve (Both side) (3 Mtr. & 1.5 Mtr.long)

## PLANT TURNAROUND - 1996

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## OFFSITE

## CIVIL JOBS

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CODE NO	JOB DESCRIPTION
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03 51 01 BHEL BOILER F-5111 :

- 1) Refractory work on burner face, combustion chamber and superheater area of BHEL Boiler.
- 2) Opening and closing of Manholes.
- 3) A.C.Shhet fixing on top of boiler.

03 51 02 COOLING TOWER :

- 1) Removing damage wooden plank and fixing new planks on channel and sump portion of cooling tower.
- 2) Fixing A.C.Corner on Urea and Ammonia side Cooling Tower.
- 3) Wood work near cooling water distributer.
- 4) Repairs of Volute chamber, Railing and plank of cooling tower Ammonia side - 1.
- 5) R.C.C foundation work for cooling water return line.
- 6) Opening Cooling Water Return and Supply line (1 M-dia) near Pump house, including excavation, dismentling wall for inspection, welding and Rapping / Coating work.
- 7) Fixing M.S.Zali with Wooden framing in chromate sludge pond.
- 8) Acid/Alkali proof brick lining on walls of strong Effluent pit "A" and Weak Effluent pit "B" and other damaged area of Effluent Treatment plant.

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OFFSITEELECTRICAL JOBS

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CODE NO	JOB DESCRIPTION
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**03 61 01 OFFSITES JOBS :**

- 1) Preventive maintenance carried out on MCC-3. All feeder compartments were cleaned and checked.
- 2) Carried out cleaning and painting of transformers TR-4A & TR-4B.
- 3) Carried out modification on feeder compartment for providing alternative power supply to Ammonia Circulating Pump motor during shut down.
- 4) Carried out preventive maintenance of TMG L.T. ACBs installed in MCC-3.
  - (a) Cleaned the contacts and mechanism.
  - (b) Checked contact pressure and adjusted.
  - (c) Lubricated the mechanism and all the moving parts.
  - (d) Checked tripping and closing timing for uniform opening and closing of poles.

**03 61 02 UTILITY JOBS:**

- 1) Provided KBLDON insulation on 11 KV busbars in new MPSS and 66 KV EHV Sub-station on all panels of TMG ACBs and KIRLOSKAR MOCBs.
- 2) Carried out servicing and replaced oil in all MOCBs in New MPSS.
- 3) Carried out servicing and replaced oil in OCB of P-4402 in Old MPSS.
- 4) Carried out preventive maintenance of L.T. ACBs installed in MCC-1, MCC-2, MCC-2F & MCC-8.
  - (a) Cleaned the contacts and mechanism.
  - (b) Checked contact pressure and adjusted.
  - (c) Lubricated the mechanism and all the moving parts.
  - (d) Checked tripping and closing timing for uniform opening and closing of poles.



CODE NO	JOB DESCRIPTION
5)	Preventive maintenance carried out on MCC-1, MCC-2B/2E, MCC-11. All feeder compartments were cleaned and checked.
6)	Carried out cleaning and painting of transformers TR-2A, TR-2B, TR-3A, TR-3B, TR-8, TR-9, TR-13.
7)	Carried out recrimping of incoming cable ( R-phase) of MCC-2E .
8)	Carried out modification on H-4402/1 feeder compartment by replacing outgoing Aluminum busbar with Copper busbar.
9)	Carried out dismantling, inspection and rewedging of BHEL make 1350 HP motor (P- 4402). Also carried out overhauling by replacing NDE and DE bearings and cleaning of Radiator Cooler.
10)	Checked, cleaned and adjusted limit & torque switches of all Motor Operated Valves as per production requirement in New Steam Generation Plant.
11)	Checked and tightened all connections in terminal boxes and push button stations of all CT fan motors.
12)	Replaced defective/broken Lighting fittings with new one on cooling towers.
	In addition to above jobs, provided connections to flood lights, hand lamps, etc., as per requirement during shut down.

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OFFSITEINSTRUMENT JOBS

CODE NO	JOB DESCRIPTION
03 71 01	<u>BHEL BOILER F-5111 :</u> <ol style="list-style-type: none"><li>1) Steam Header Pressure Gauge Calibration checked &amp; Found O.K.</li><li>2) Steam Drum Pressure Gauge Calibration checked and found okay.</li><li>3) TRC-4 Calibration checked</li><li>4) Following level switches actuation was .<ol style="list-style-type: none"><li>a) Level High Alarm.</li><li>b) Level Low Alarm.</li><li>c) Drum Level Extra low level trip.</li></ol></li></ol> <p><u>THE ABOVE CHECKINGS ARE REQUIRED BY BOILER INSPECTOR</u></p> <ol style="list-style-type: none"><li>5) EYE-HYE electrodes &amp; wires were inspected &amp; (+2) (+4) Electrodes were replaced.</li><li>6) Following Dampers operation were checked &amp; found O.K.<ol style="list-style-type: none"><li>a) F.D Fan inlet damper.</li><li>b) F.D.Fan outlet damper.</li><li>c) Regeneration heater inlet damper.</li><li>d) Regeneration heater outlet damper .(Replaced solenoid by schrader make.</li><li>e) Burner Air damper. checked positioner &amp; limit switches operation.</li></ol></li><li>7) Flushed Following Furnace &amp; stack pressure tappings.<ol style="list-style-type: none"><li>a) PSH-11 Furnace pressure high alarm.</li><li>b) PSH-12 Furnace pressure Trip.</li><li>c) PDA-12 Stack pressure tapping.</li><li>d) RAH inlet/outlet tappings.</li></ol></li></ol>

CODE NO

JOB DESCRIPTION

- 8) Checked strokes , gland leakage, bonnet leakage, valve positioner, and air regulator cleaning of following Control Valves :-
- a) 100% B.F.W Control valve (inspected the seat and plug)
  - b) 30% B.F.W. Control valve (inspected the seat and plug)
  - c) TCV-1 (inspected seat and plug)
  - d) TCV-2 (Replaced the bonnet gasket)
  - e) Atomising steam pressure control valve.
  - f) Oil pressure control valve.
  - g) 60 ata to 14 ata let-down control valve.
  - h) PCV-2 control valve.
  - i) Soot Blower control valve.
  - j) Deaerator Level control valve LRCV-4.
  - k) Deaerator pressure control valve. PICV-50.
  - l) Deaerator overflow valve operation checked.  
(Junction box of solenoid valve is replaced & relocated.)
  - m) Oil temp control valve. (made new stem & lapping was done.)
  - n) HOHTV control valve operation checked.
  - o) BTV 1-1.1-2.2-3 changed the diaphragm. checked operation from control room.
- 9) Checked ignitor gun for tip burning. it is found O.K.
- 10) Deaerator overflow inter lock system checked found to be O.K.
- 11) Overhauled the gun engagement limit switch assy.
- 12) O2 ANR. sample line flushed.
- 13) Oil & Gas flame scanner detector unit cleaned.
- 14) Control room air header pressure regulators checked.

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CODE NOJOB DESCRIPTION  
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- 15) Checked the calibrations of following instrument in control room.

PENUMATIC INSTRUMENTS :

- 1) All recorders , controllers , receiver gauges , sq.rt.extrs.,counters.

DIGITAL TEMP.INSTRUMENTS :

- 1) All Digital Temperature Indicators , recorders , controller.
- 16) Filled Glycol in the impulse lines following LSHS instruments.
- a) Oil flow transmitter - Orifice FT-23.
  - b) Oil Pressure transmitters PT-21 & PT-22.
  - c) Oil Pressure switches PAL-22, PSL-23, PS-21.
  - d) Day tank level transmitter LT-5.
  - e) Oil pressure controller - PT-25 Recirculation.
- 17) Checked B.M.S.panel and observed operation of contactors
- 18) Reliability checking of inverter and charger and batteries UPS-checking was done as per procedure.
- a) Switched off the battery charger first for five minutes and noted performance of inverter.Switched on the charger, run it till battery current becomes normal.
  - b) Again switched off the charger for ten minutes and observed performance of the inverter - normalise the system.

STATIC SWITCH CHECKING :

- a) Confirmed that mains is present.
- b) Switched off the inverter output and confirm that switching over of the load to mains is smooth.
- c) Waited for one minute and then switched ON the inverter output.
- d) Transferred load to inverter by Reset push button.

BATTERY CHECKING:

- a) Checked battery Banks physically and voltage of each battery and found O.K.

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CODE NO	JOB DESCRIPTION
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**03 71 02 COOLING TOWER :**

- 1) Checked and cleaned valve positioner of HICV-5153AND5154 Flushed their regulator & checked control valve stroke. Found O.K. also filled gland packing in HICV-5153.
- 2) LCV-4401 control valve positioner cleaned and checked stroke. Found O.K. The control valve was painted, provided gland packing.
- 3) Basin level transmitter air supply regulator was replaced.
- 4) Checked the techo generator of Q-4401 A/B, found O.K. Junction box for techo generator for Q-4401 A was provided with new support.
- 5) P-4402 Removed R.T.D. connections/ R.T.D. for electrical maintenance. Refixed the same after electrical job.
- 6) Raw water tank inlet line flow element i.e ANNUBAR was installed Also installed D.P. Transmitter after calibrating it as per design range. 0 to 128 mm H<sub>2</sub>O. Provided 1/4" valve on upstream air regulator. Flow range 724 m<sup>3</sup>/hour. Multiplying factor is R\*72.4 m<sup>3</sup>/hour.

**03 71 03 WATER TREATMENT PLANT :**

- 1) Control room air headers regulators were overhauled Two of regulator bowls were replaced as they found defective.
- 2) C.T. make-up transmitter to junction box. laid new copper tube.
- 3) Cation/Anion 1,2,4. Signal tubes from junction box to valves were dressed and were provided conduit for environmental protection.
- 4) Shifted one junction box near anion 4 to nearby pillar.
- 5) Tightened all the terminals of terminal strips as well as contactors.

**03 71 04 CHROMATE REMOVAL :**

- 1) Strong Effluent P.H. sensor assembly mounting box was replaced.
- 2) Relocated weak effluent flow transmitter to accommodate space for mechanical maintenance.

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CODE NO	JOB DESCRIPTION
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**03 71 05 OLD BOILER F-5101 :**

- 1) Attended start-up and shut down activities. The boiler No.1 was started and shut down twice.

**03 71 06 AMMONIA STORAGE AREA :**

- 1) Cleaning of all electrical junction boxes for transmitter and p/s was carried out as there was ammonia vapor effect on termination protecting sealing was provided.
- 2) Painting & tagging of all control valves in the area was done.
- 3) Cleaning of panel and PLC cabinet was carried out.
- 4) Base temperature controller was checked.
- 5) LSHS storage tank A-B&C temperature control valves overhauled, painted and stroke checking was done.
- 6) LSHS storage tank A-B&C temperature controllers were overhauled, and synchronisation was checked.
- 7) LSHS storage tank A-B&C level transmitters F/N & Relays were cleaned.
- 8) LT-3002 Level transmitter zero was checked.

**03 71 07 UTILITY JOBS :**

- 1) Provided KBLDON insulation on 11 KV busbars in new MPSS and 66 KV EHV Sub-station on all panels of TMG ACBs and KIRLOSKAR MOCBs.
- 2) Carried out servicing and replaced oil in all MOCBs in New MPSS.
- 3) Carried out servicing and replaced oil in OCB of P-4402 in Old MPSS.
- 4) Carried out preventive maintenance of L.T. ACBs installed in MCC-1, MCC-2, MCC-2F & MCC-8.
  - (a) Cleaned the contacts and mechanism.
  - (b) Checked contact pressure and adjusted.
  - (c) Lubricated the mechanism and all the moving parts.
  - (d) Checked tripping and closing timing for uniform opening and closing of poles.

CODE NO	JOB DESCRIPTION
5)	Preventive maintenance carried out on MCC-1.MCC-2B/2E.MCC-11. All feeder compartments were cleaned and checked.
6)	Carried out cleaning and painting of transformers TR-2A. TR-2B. TR-3A. TR-3B. TR-8, TR-9, TR-13.
7)	Carried out recrimping of incoming cable ( R-phase) of MCC-2E .
8)	Carried out modification on H-4402/1 feeder compartment by replacing outgoing Aluminum busbar with Copper busbar.
9)	Carried out dismantling,inspection and rewedging of BHEL make 1350 HP motor (P- 4402). Also carried out overhauling by replacing NDE and DE bearings and cleaning of Radiator Cooler.
10)	Checked.cleaned and adjusted limit & torque switches of all Motor Operated Valves as per production requirement in New Steam Generation Plant.
11)	Checked and tightened all connections in terminal boxes and push button stations of all CT fan motors.
12)	Replaced defective/broken Lighting fittings with new one on cooling towers.
	In addition to above jobs, provided connections to flood lights, hand lamps, etc., as per requirement during shut down.
13)	Preventive maintenance carried out on MCC-3.All feeder compartments were cleaned and checked.
14)	Carried out cleaning and painting of transformers TR-4A & TR-4B.
15)	Carried out modification on feeder compartment for providing alternative power supply to Ammonia Circulating Pump motor .
16)	Carried out preventive maintenance of TMG L.T. ACBs installed in MCC-3.
	(a) Cleaned the contacts and mechanism.
	(b) Checked contact pressure and adjusted.
	(c) Lubricated the mechanism and all the moving parts.
	(d) Checked tripping and closing timing for uniform opening and closing of poles.

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B&MH PLANTMECHANICAL JOBS

<u>CODE NO</u>	<u>JOB DESCRIPTION</u>
04 02 01	<u>NAPHTHA FEED PUMP P-3302</u> a) Replaced 2 Nos of SS 304 ball valves in the discharge liine. b) Replaced 2 Nos of SS 304 ball valves in minimum flow line. c) Replaced the thrust bearing and Dura Mech.seal of Naphtha feed pump towards tank side.
04 03 01	<u>HOPPER FLOOR BLOWERS</u> a) Replaced the coupling assembly of the south side blower. b) Replaced the coupling assembly of solution pump with pad. c) Lubricate the grease points.
04 20 01	<u>VIBRATING SCREENS</u> Attended all 4 nos of screens for cleaning by removing top cover.
04 21 01	<u>PLANT TRANSFER CONVEYOR M-2110</u> a) Replaced defective return rollers. b) Attended all carrier rollers for their oiling and made them free for operation. c) Replaced the skirit rubbers at tail end side of either side. d) Attended one vulcanising joint by removing damaged clip joint. e) Attended gearbox for coupling bush replacement and oil replacing. f) Attended the coupling alingments and made okey.



CODE NO	JOB DESCRIPTION
02 21 02	<u>FRESH UREA SHUTTLE CONVEYOR M-2112</u> <ul style="list-style-type: none"> <li>a) Two nos vulcanising joint attended and made okey.</li> <li>b) Replaced the return roller found jam.</li> <li>c) Attended the carrier rollers for oiling.</li> <li>d) Attended gear box for coupling bush replacement and oil replacing.</li> <li>e) Replaced the skirt rubber at tail end side.</li> </ul>
04 21 03	<u>RECLAIM CONVEYOR M-2117</u> <ul style="list-style-type: none"> <li>a) Replaced all return rollers.</li> <li>b) Replaced gear box coupling bushes and replacing of oil.</li> <li>c) Attended damaged portion of joint and added 7 nos of fastners to repair the damaged joint.</li> <li>d) Replaced the tail pulley with two nos of MPG-75 pollard bearings.</li> </ul>
04 21 04	<u>BAGGING FEED CONVEYOR M-2121</u> <ul style="list-style-type: none"> <li>a) Replaced the complete 750 MM wide belt of nylon three ply - 225 meter long and vulcanized the joint.</li> <li>b) Replaced the damaged return roller.</li> <li>c) Replaced the coupling bushes of gear box and pulley side coupling.</li> <li>d) Oil of gear box replaced.</li> <li>e) Replaced the scraper rubber of drive pulley side.</li> <li>f) All the carrier rollers attended to make them free.</li> <li>g) Replaced the tail end skirt rubber at both side.</li> </ul>
04 21 05	<u>BAGGING HOPPER FEED CONVEYORS M-2122 &amp; M-2123</u> <ul style="list-style-type: none"> <li>a) Two joints vulcanized.</li> <li>b) Replaced the returner rollers.</li> <li>c) Replaced the coupling bushes and oil replaced.</li> <li>d) Attended the tripper gear box for coupling bush replacement and alignment.</li> <li>e) Provided the breather pipe on top of gear box.</li> </ul>

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CODE NO                      JOB DESCRIPTION  
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04 21 06    BAG STITCHING SLAT CONVEYOR M-2124

- a) Replaced the gear box coupling bushes and oil replaced.
- b) Lubricated all grease points of pollard bearings.
- c) Attended the sack grip assemblies for their effective operation by replacing of belts and also air cylinder repair kit.

04 21 07    CHUTE NO.4

6 Nos rollers alongwith bearing replaced and made vibration free.

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CODE NO	JOB DESCRIPTION
04 61 01	(01) Carried out cleaning and painting of transformers TR-5A & TR-5B.
	(02) Carried out preventive maintenance of TMG L.T.ACBs installed in MCC-4
	(a) Cleaned the contacts and mechanism.
	(b) Checked contact pressure and adjusted.
	(c) Lubricated the mechanism and all the moving parts.
	(d) Checked tripping and closing timing for uniform opening and closing of poles.
	(03) Preventive maintenance carried out on MCC-4 & MCC-4A. All feeder compartments were cleaned and checked.
	(04) Replaced Trailing cable of Hopper Tripper .

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INSTRUMENT JOBS

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CODE NO	JOB DESCRIPTION
04 71 01	(01) Packer scale no.1.2.3.4.7.8 were overhauled and calibrated from Instrument side.
	(02) All Platform weighing M/cs of Libra were overhauled and calibrated.
	(03) M/c no.6 control panel for electro mechanical machine was prepared on top priority.wiring installation of comp.& checking was done.
	(04) Checking of weigh bridge at maingate was done for linkages.bolts etc.