

1997-1

INFO REPORT 31

IFFCO

KALOL UNIT

PLANNING SECTION  
MAINTENANCE DEPT.  
REPORT NO: 17/1997

REPORT  
ON  
PLANT-TURNAROUND

(MAY-JUNE-1997)

INDIAN FARMERS FERTILISER CO-OPERATIVE LIMITED

I N D E X

PLANT

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Ammonia Plant as well as Urea Plant were stopped for Plant Turnaround on 12th May 1997. Apart from major overhauls of various equipments; several important tapings as well as erection jobs related with Kalol Expansion Project were also carried out during this plant turnaround.

In Ammonia plant Air Compressor Revamp Job was taken up under the supervision of Demag Delaval representative for increasing the capacity of the compressor. All internals of LP and HP cases of the Air compressor were replaced during this revamp. The output of Air Compressor Drive turbine was also increased by replacing its nozzle ring as well as 2nd stage diaphragm. Other critical jobs taken up in the Ammonia plant were steam chest replacement of 103-JAT, providing SS inserts in 105-JT casing insitu by M/s. CFS, USA. for protection against moisture erosion, replacement of Arch Burner Assembly of M/s. Jhon Zinc USA in Primary Reformer (101-B) and changing of MEA solution in CO2 removal system by MDEA solution.

Other normal overhauling/preventive maintenance jobs like catalyst replacement of Secondary Reformer (103-D), catalyst replacement of HTS, overhauling of 102-J / 104-JT / 104-JAT / 107-JT / 101-BJT / 103-JLJT / 102-JLJT / 102-JSJT were also carried out. The tube bundle of one of the MEA exchangers (108-C1B) was also replaced during this plant turnaround. The cleaning of Heat exchangers was carried out by Hydrojetting and finally boxed up after Hydrotest. Several tubes of 131-JC, 105-C and 111-C were replaced by M/s. S.R. Engineering, Vadodara.

In Urea Plant, the major job of chemical cleaning of stripper tubes was done by M/s. Houseman under the inspection by M/s. Stamicarbon bV, Netherlands. The other major job of Autoclave tray modification was carried out by M/s. L&T under the supervision of M/s. Schoeller & Blakmann, Austria. The CO2 centrifugal compressor (K-1101/1) as well as its drive turbine (Q-1101/1) were taken for major overhauling. PB Compressor drive turbine was also taken up for major overhauling, while various preventive activities were carried out in PB Compressor (K-1101/2), Ammonia Pump (P-1102/B), Carbamate pump (P-1201/B), Prill tower ID Fans (K-1401 to K-1404) and PCS Fans (K-1701, K-1702). Cleaning of various Heat Exchangers was carried out by Hydrojetting and finally the same were boxed up after Hydrotesting.

In offsites plant, IBR inspection of BHEL Boiler as well as preventive maintenance of BFW Pump, its drive turbine, F D Fan and its drive turbine were taken up alongwith other miscellaneous jobs in BHEL boiler. The Regenerative Air Heater in the BHEL Boiler was overhauled in the presence of representative of M/s. BHEL. The drive turbine (Q-4401-A) for cooling water pump (P-4401-A) was removed from location and in its place new Elliot make condensing turbine was installed. The erection and precommissioning activities of the new condensing turbine and its condensor were started.

In Bagging and Material Handling area, conveyor belt no. M-2112 was replaced, 4 nos. wheels of Tripper car for conveyor belt M-2123 were changed, Two way chute was provided in the conveyor no. M-2121. Reclaim machine M-2116 was overhauled. Other normal preventive maintenance jobs were done on Packer scales, Naptha tanks T-3301 A/B, P-3102/A etc.

### ELECTRICAL JOBS :

Preventive maintenance of transformers, feeder compartments and ACB's of Ammonia, Urea, Offsites and Bagging Plants were carried out. Also certain critical motors were taken for the overhauling. The preventive maintenance of 66KV, 11KV OCBs, MOCBs and VCBs were carried out.

### INSTRUMENT JOBS :

Various critical control valves of Ammonia, Urea and Offsites plants were overhauled and various pressure transmitters were also calibrated. All control room instruments were cleaned and inspected. Most of the controls in the control room were taken on DCS in Ammonia and Urea plant.

### TECHNICAL DEPARTMENT JOBS:

In Ammonia plant modification was carried out in distributor of CO<sub>2</sub> stripper for better distribution of flow. Seal oil separator for 102-J/103-JLP as well as NG Filters in Gas metering station were replaced for improvement in performance. In Urea plant knock out pot was provided for the outgoing condensate of H-1422. In Offsites plant provision was made for intermixing of cooling water of old and new cooling towers. In B&MH plant belt conveyor no.s M-1403, M-1419, M-1421, M-2110, M-2112, M-2121 AND M-2122 were modified for capacity enhancement from 1200 MTPD to 1650 MTPD.

### PROJECT JOBS :

Various project related jobs were carried out during this shut down in Ammonia Plant, Urea Plant, Offsites Plant as well as in Bagging area. This jobs were carried out by M/s. L&T under supervision of PDIL (in Ammonia plant) and TICB (in Urea and offsites plant). In Ammonia plant tappings were taken for hooking up of Naptha Prereformer, NG Booster compressor, Syn. gas compressor suction chiller etc. Some critical lines for 105ata, 38ata steam and air were also changed during this shutdown period. All connecting pipings were hooked up for new 123-C exchanger and the same was commissioned.

After completion of all above jobs Urea Plant was started on 17th June 1997.

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THE PLANT TURNAROUNDS AT A GLANCE

SR. NO.	YEAR	AMMONIA - PLANT				UREA - PLANT				REASON IF ANY
		PERIOD FROM	TO	DOWN TIME DAYS	TIME HRS	FROM	TO	DOWN TIME 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	-	101-8 (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	429.0	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-1203-8D
16	1996	14-06-96	13-07-96	30	712.00	13-06-96	13-07-96	30	694.25	Autoclave V-1201 Leakage
17	1997	12-05-97	17-06-97	35.6	875.00	12-05-97	17-06-97	36.2	870.50	Planned

PLANT TURNAROUND - MAY - JUNE - 1997

GENERAL - DETAILS

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SR.NO.	CATEGORY	QUANTITY
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EQUIPMENTS UTILISED:

01	<u>IFFCO :</u>	01
	55 T HM Crane	01
	15 T Coles Crane	01
	18 T Tata Crane	03
	03 T Forklift	01
	Truck	
	<u>HIRED :</u>	01
	75 T Tata 955 ALC	01
	03 T Forklift	

02

IFFCO - MANPOWER :

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

HIRED - CONTRACT MANPOWER

Sr.No.	Category	Mandays
01	Mill Wright Fitter	57
02	General Fitter	1006
03	Rigger	1276
04	S.S.Rigger	3300
05	Fabricator	206
06	Grinder	235
07	IBR Welder	36
08	Non-IBR Welder	244
09	Carpenter	34

HIRED - IFFCO TIME OFFICE

Labour unskilled 1200 Mandays

MAINTENANCE JOBS CARRIED OUT BY OUTSIDE AGENCIES

7

SR. NO.	JOBS CARRIED OUT	CONTRACTORS NAME	W.O.NO. & DATE
01	HIRING OF SERVICE FOR OVERHAULING & REVAMPING JOB OF AIR COMPRESSOR TRAIN.	M/S.GANGOTRI TURBOTECH HYDERABAD	E-7763 04/04/97
02	ONSITE REPAIRING OF VALVES DURING TURN-AROUND IN AMMONIA PLANT.	M/S.DANDY ENGG.CO AHMEDABAD	01295 05/04/97
03	OPENING & BOX - UP OF HEAT EXCHANGER IN AMMONIA & UREA PLANT.	M/S.GENERAL ENGG.WORKS BHARUCH	E-7739 02/04/97
04	RETUBING OF THIRD STAGE INTER COOLER OF AIR COMPRESSOR (131-JC)	M/S.S.R.ENGG. VADODARA	E-7729 17/09/96
05	HIRING OF SERVICES FOR OVERHAULING OF NG COMPR. & TURBINE IN AMMONIA PLANT.	M/S.BHEL HYDERABAD	E-7732 26/05/97
06	HYDROJETTING OF VARIOUS HEAT EXCHANGERS.	M/S.USHA HYDRODYNAMICS NEW DELHI	E-6669 20/10/95
07	SUPERVISOR CHARGES FOR REPAIR OF REFORMER ARCH ROOF INSULATION 101-B.	M/S.ORIENT CERAWOOL (I) LTD.BOMBAY	01226 17/02/97
08	REPAIR OF AUX. BOILER FRONT VALVE & CONVECTION SECTION OF PRIMARY REFORMER 101-B.	M/S.SAHANI ASSOCIATES VADODARA	01445 23/04/97
09	HIRING OF CRANE SERVICES FOR PLANT TURNAROUND.	M/S.J.H.PARABIA & CO. VADODARA.	E-6683 15/04/97
10	FABRICATION, SUPPLY AND ERECTION OF COOLING WATER DISTRIBUTION HEADER IN OFFSITE PLANT.	M/S.TECHNOCON PROJECT & ENGG. VADODARA	0533 03/04/97
11	SERVICING & INSPECTION OF SLUICE GATES IN OFFSITE PLANT.	M/S.JASH ENGG. INDORE.	E-8371 09/07/96
12	SERVICES OF ENGINEER FOR O/H & MODIFICATION OF RAH UNIT OF BHEL BOILER.	M/S.BHEL TRICHI	E-8367 19/02/96

MAINTENANCE JOBS CARRIED OUT BY OUTSIDE AGENCIES

8

SR. NO.	JOBS CARRIED OUT	CONTRACTORS NAME	W.O.NO. & DATE
13	HIRING OF 3 TONNE FORKLIFT FOR PLANT TURNAROUND.	M/S.REACH CARGO MOTORS.BOMBAY	E-6682 03/03/97
14	HIRING OF SKILLED MANPOWER FOR CARRY OUT VARIOUS MAINT. JOBS IN PLANT TURNAROUND.	M/S.GENERAL ENGG. WORKS. BHARUCH	E-6674 09/03/96 E-2082 08/07/97
15	SUPPLY & APPLICATION OF BELZONA COLD WELDING COMPOUND IN CO2 ABSORBER (101-E) BETWEEN TRAY NO.17 & 20.	M/S.AVEE ENTERPRISE AHMEDABAD.	02078 02/07/97 & 03/07/97
16	RETUBING OF CHOKED TUBES OF HEAT EXCHANGER 105-CA/CB & 111-CB IN AMMONIA PLANT.	M/S.S.R.ENGG. VADODRA	01277 01/07/97
17	RE-EXPANDING OF TUBES OF HEAT EXCHANGER 115-C.	M/S.S.R.ENGG. VADODARA	02184 02/07/97

PLANT TURNAROUND - MAY - JUNE 1997AMMONIA PLANTMECHANICAL JOBS

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JOB CODE	JOB DISCRIPTION
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**01 01 01 PROCESS AIR COMPRESSOR TRAIN 101-J/101-JT REVAMP :**

Air compressor was stopped for the major job of air compressor train revamp on 12/05/97 and was made available for maintenance at 11.30 hrs.

The Air compressor train revamp job was awarded to M/s.Gangotri Turbotech, Hyderabad. Following are the salient features of the Air compressor train revamp job.

**(A) SALIENT FEATURES :**

Air compressor train revamp was being carried out to increase the capacity of the compressor 1,06,965 lb/hr to 1,27,258 lb/hr.

To have higher output of air compressor, the air compressor drive turbine capacity was also increased from 9600 HP to 13095 HP.

For obtaining above capacities ; Following internal modifications were carried out in the compressor and turbine.

**101-JHP CASE :**

- 7 stage rotor assembly was replaced with 8 stage rotor assembly.
- All diaphragms and diffusers were removed and replaced with new ones to accomodate 8 stage rotor.
- All labyrinths and diaphragm bushings were replaced with new ones in FLORSINT material.
- Both the end seals and balance drum labyrinth were replaced with new ones of FLORSINT type.

**101-JLP CASE :**

- 4 Stage rotor assembly was replaced with new 5 stage rotor assembly.
- All diaphragms and diffusers were replaced with new ones to accomodate 5 stage rotor assembly.

JOB CODE

JOB DESCRIPTION

10

- All labyrinths and diaphragm bushings were replaced with new ones in FLORSINT material.
- Both end seals and balance piston labyrinth were replaced with new ones in FLORSINT material.

**101-JT TURBINE :**

- Modified rotor assembly (TR-456) was installed for enhancing the turbine output.
- Diaphragm for 2nd stage was replaced with modified design diaphragm.
- Nozzle ring assembly was replaced with new one having 28 Nos nozzles instead of 22 Nos in the old one.

Apart from the above, all gear coupling were proposed to be replaced with diaphragm type CENTRIFLEX couplings, however due to reasons mentioned in Para - (C) only couplings and coupling guards between 101-JT to 101-JLP and 101-JR to 101-JHP could be replaced with the new type.

**(B) EXECUTION OF AIR COMPRESSOR REVAMP :**

As the job of Air compressor revamp was to be completed in minimum possible period; the working group was divided into three groups each for HP case compressor, LP case compressor and Turbine.

HM Crane with 120 ft boom was used for removal / installation of casing / diaphragms and rotor of all the three casings. The area behind 101-J / 127-C and between 102-J and PGR plant was totally excavated before shutdown for laying of underground cooling water lines for connection to 101-JCA during the shutdown.

This area remained excavated almost through out the shutdown period and hence though the shutdown was taken on 12/5/97, HM crane could be brought near 127-C for the 101-J revamp job on 15th May 1997. The job was normally done 08.00 hrs. to 22.00 hrs and the crew for night shift was detained on as and when required basis.

JOB CODE

JOB DESCRIPTION

11

101-JT TURBINE :

The following jobs were done in the air compressor drive turbine.

- All exhaust pipings, bellow, casing upper halve and steam inlet line were removed.
- Bearings were opened.
- Rotor assembly was removed.
- All diaphragms were removed.
- The upper half of casing was turned and the old nozzle ring in it consiting of 22 Nos openings was removed.
- All the upper and bottom halves of the diaphragms were cleaned with sandblasting.
- The 1st diaphragm i.e. 2nd stage diaphragm) was removed and replaced with a new (modified) one for higher capacity.
- All other diaphragms were reused.
- The modifed rotor assembly for higher capacity (Rotor no.TR-456) was installed.
- The interstage labyrinth and gland sealing labyrinth clearances were checked and noted down.
- All the labyrinth seals were reused as clearances were within limits.
- The journal bearing clearances were checked and found to be O.K.
- The coupling hub was removed and the hub for diaphragm coupling was installed on the rotor.
- The new nozzle ring consisting 28 Nos guide blades was installed in the upper half of the casing.
- The thrust bearing housing drawing was studied in detail and 3 No drain holes in the bottom of it were plugged for flooded operation of the thrust bearing in consultation with M/s.DDTC.
- The governor was dismantled and overhauled ; its bearing (part No.2 ) and bush (part No.115) were replaced.

- The TTV was dismantled and overhauled and made free to operate.
- The turbine was assembled, its axial position was set, thrust bearing clearance was set and was finally boxed up.
- During start up, an OST of turbine was done after 3 trials at 7200 rpm.

101-J LP CASE :

Following jobs were done in the LP case of the air compressor.

- The casing bolts were loosed.
- The machine was decoupled from the turbine and the gear box.
- Bearing housing covers were opened and bearings were removed.
- The upper half of the casing was lifted with the help of HM crane and lowered on the wooden slippers kept on the ground.
- The rotor assembly was removed and shifted from the site.
- All the old diaphragms in the bottom half as well as the diffuser ring on the discharge end of the casing was removed after loosening by RUSTLICK Solution.
- The top half of the casing was turned upside down with the help of two cranes and all its diaphragm halves and diffuser ring were removed after loosening by Rustlick and by hammering.
- Both the casing halves were internally cleaned thoroughly with the help of CTC, wire brush and sandering machine.
- An additional groove for placing inner barrel consisting the 3 Nos new diaphragm was made by the personnel of M/s.Continental Field Services, USA in both the casing halves.
- After finishing the groove in both the casing halves ; the internal surface of the casing as well as all the grooves for locating diaphragms were cleaned thoroughly with the help of filing / grinding and checked for proper fitting of diaphragms.

JOB CODE

JOB DESCRIPTION

13

- All the new diaphragms were placed in their respective grooves and their partition plane levels were recorded with dial indicator w.r.t. the partition plane of the casing for all the diaphragm halves.

The partition plane levels for two matching diaphragm halves should have a difference of about 0.02mm to 0.04mm so that the partition planes of the casing can match with each other after assembly of top and bottom halves of casing.

For matching the partition plane levels, blue matching was done for the diaphragm on its circumferential seating area and visible high spots were filed or ground to bring the diaphragm half in correct concentric position w.r.t. the casing center line and till it remains about 0.01 to 0.02mm below the partition plane level of the casing.

- The thrust end bearing housing of the LP case was to be replaced with new one because of the uneven sizes of allen bolts and high vibrations.

The same was replaced with the new one. When the machining of groove in bottom half was over by the tooling of M/s.CPS; the same tooling was utilized for checking the centering of the new bearing housing w.r.t. centreline of the casing. The centering of the bearing housing was done to 0.02mm. TIR and then the tooling was removed from the casing.

- After centering of the new bearing housing; the new rotor assembly was placed on the bottom halves of both end journal bearings and positioned in its optimum axial position.

- All the bottom halves of new diaphragm impeller seals, diaphragm shaft seals, end seals and balance drum seal were placed into their respective position for checking the clearances.

The bottom clearance was checked with leadwire and side clearance was checked with the filler gauge.

- Thereafter the top halves of the seal rings were placed above their respective bottom halves and the top clearance was checked with the filler guage.

JOB CODE

JOB DESCRIPTION

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- The impeller positions w.r.t. each diaphragm passages were noted down on both the sides with rotor in optimum position.
- All the top halves of diaphragms and inner barrel were placed in the respective positions of the top half of casing and locked into position with the help of grub screws.
- After assembly of top halves of diaphragms ; the upper half of casing was lifted , turned upside down and placed in its position.
- All the casing bolts were tightened and rotor was rotated for free rotation.
- The bearing clearances were checked, thrust clearance was adjusted and both the bearings were boxed up.

#### 101-JHP CASE :

Following jobs were done in the HP case of Air compressor.

- The casing bolts were loosened.
- The machine was decoupled from the turbine and the gear box.
- Bearing housing covers were opened and bearings were removed.
- The upper half of the casing was lifted with the help of HM crane and lowered on the wooden slippers kept on the ground.
- The rotor assembly was removed and shifted from the site.
- All the old diaphragms in the bottom half as well as the diffuser ring on the discharge end of the casing was removed after loosening by RUSTLICK.
- The top half of the casing was shifted in a truck to the workshop for removal of the diaphragms with the help of EOT crane and all diaphragm halves and diffuser ring were removed after loosening by rustlick and by hammering.
- Both the casing halves were internally cleaned thoroughly with the help of CTC, wire brush and sandering machine.

JOB CODE

JOB DESCRIPTION

15

- After finishing the groove in both the casing halves ; the internal surface of the casing as well as all the grooves for locating diaphragms were cleaned thoroughly with the help of filing / grinding and checked for proper fitting of diaphragms.
- All the new diaphragms were placed in their respective grooves and their partition plane levels were recorded with dial indicator w.r.t. the partition plane of the casing for all the diaphragm halves.

The partition plane levels for two matching diaphragm halves should have a difference of about 0.02mm to 0.04mm so that the partition planes of the casing can match with each other after assembly of top and bottom halves of casing.

For matching the partition plane levels, blue matching was done for the diaphragm on its circumferential seating area and visible high spots were filed or ground to bring the diaphragm half in correct concentric position w.r.t. the casing center line and till it remains about 0.01 to 0.02 mm below the partition plane level of the casing.

- All the bottom halves of new diaphragm impeller seals, diaphragm shaft seats, end seals and balance drum seal were placed into their respective position for checking the clearances. The bottom clearance was checked with leadwire and side clearance was checked with the filler gauge.
- Thereafter the top halves of the seal rings were placed above their respective bottom halves and the top clearance was checked with the filler gauge.
- The impeller positions w.r.t. each diaphragm passages were noted down on both the sides with rotor in optimum position.
- All the top halves of diaphragms and inner barrel were placed in the respective positions of the top half of casing and locked into position with the help of grub screws.
- After assembly of top halves of diaphragms ; the upper half of casing was lifted, turned upside down and placed in its position.

JOB CODE

JOB DESCRIPTION

16

- All the casing bolts were tightened and rotor was rotated for free rotation.
- The bearing clearances were checked, thrust clearance was adjusted and both the bearings were boxed up.

#### 101-J GEAR BOX :

The gear box was opened, oil was drained, its gear and pinion were removed and the casing was thoroughly cleaned.

After cleaning, the gear and pinion were again placed into position. The condition of the pinion and gear was found to be okay.

The bearing clearances were checked and found to be okay. Hence the gear box was finally boxed up.

#### ALIGNMENT AND COUPLING :

The alignment between turbine to L.P. Case, L.P. Case to gear box and gear box to H.P. case was checked and found to be different than the required in all the cases. Hence it was decided to correct the same.

For correcting the alignment, additional shims were given below LP case & H.P. case casing. The alignment data are attached in the annexures.

All three gear couplings were to be replaced with shim packed diaphragm couplings. However the coupling between 101-JLP case and gear box was not changed because of the O ring failure on the LP case rotor coupling hub while installing the coupling hub for diaphragm coupling on the same.

The required pre-stretch in all the couplings was given as per the requirement and the same is covered in the annexures.

#### (C) PROBLEMS FACED DURING THE EXECUTION :

- a) Too much of rusting was found in the old diaphragms which had stuck up all the diaphragms and making the diaphragms removal difficult.

Even after application of Rustlick & severe hammering; some diaphragm halves (especially the bottom ones) in both the LP & HP casings could not come out and special fixture were required to be made for their removal.

JOB CODE

JOB DESCRIPTION

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- b) Thinking that while removing the nozzle ring ; the locking capscrews and its wedges may get damaged ; M/s.DDIC was asked to supply these items on to site on urgent basis. M/s.DDTC supplied both the capscrews & wedge ring through DHL couriers.

However during installation of the nozzle ring the new wedge ring was not required and the old wedge ring only was reused.

- c) Before revamping we were operating 101-J turbine in summer with thrust pad temperature reaching as high as 125 deg.C and with revamped conditions this will further increase. Hence M/s.DDTC was contacted and they suggested that for flooded operation of the thrust bearing the 3 Nos drain holes in the bottom of the bearing housing are required to be plugged. Accordingly the 3 Nos of drain holes were plugged.

- d) M/s.DDTC had confirmed earlier that the modified shafts for both LP case and HP case shall not have any difference on coupling areas or bearing areas. However while installation following difference were observed.

- 1) In LP case rotor the new shaft on turbine side coupling end was not having a step of 4.234 dia between journal bearing and coupling and instead it was having a plain diameter of 4.493" dia in that area.

This made it difficult to install the old oil guard (Symbol No.CF588K) When contacted DDTC they sent the new knife edge oil guard (Symbol No.AF587BC) for this area on urgent basis which was installed.

- 2) In the other end ( Gear box end ) of the LP case rotor, the step of 4.434" dia was not available on the new rotor on the inboard side of the thrust collar and instead the journal diameter 4.493" dia continued till the thrust collar.

Here also M/s.DDTC sent a new modified oil guard (Symbol No.CF4010A) in place of old oil guard (Symbol No.CF588c) which was used.

JOB CODE	JOB DESCRIPTION
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3) Similarly in the new H.P.case rotor the step of 3.984" dia between the coupling and journal bearing on coupling end was not available and instead a journal diameter of 2.997" dia continued till the beginning of coupling taper. Leaving about 1" diametrical gap between the old oil guard (Symbol No.AF 588 AK) and new rotor. Hence when contacted a new oil guard (Symbol No.AF 588 AZ) was supplied by M/s.DDTC.for this area which was installed.

e) The "O" rings for the coupling of HP case rotor Symbol No.320430 supplied by M/s.DDTC were too big and hence they were requested to supply new "O" rings as a replacement. However they again supplied the same size "O" rings which could not be used.

Finally we used "O" ring from our stock for the old coupling which was same in size as required.

f) The coupling hub on the 101-JLP case rotor for the new diaphragm coupling between 101-JLP case and 101-J gear box got stuck up at the time of installation because of the "O" ring failures.

It was tried for removal by using Hylomer, RTV silicon sealant, Belazone HP Hybuild compounds etc. but could not be removed by any of the methods.

Finally it was decided to cut off the coupling hub and remove the same and install the old gear coupling hubs on both the 101-JLP rotor and 101-JR rotor.

Hence the gear coupling between 101-JLP to 101-J gear box could not be replaced with the new diaphragm coupling.

g) The air maize breather for the coupling guards for diaphragm couplings were not supplied along with the package hence the same were fabricated in our workshop with the use of 100 Mesh wiremesh.

h) The instrument probes for radial vibrations at paint No.04 (LP case north) and 09 (HP case south) had to be changed as they were mounted on oil guards and these oil guards were replaced with new ones.

JOB CODE

JOB DESCRIPTION

19

The radial probes for point NO.4 and point No.9 were mounted on the bearing base ring.

- i) During slow roll of the turbine before DST, high shaft vibration of the order of 4 to 5 mils were observed for both the journal bearings on the panel. When checked with IRD Mechanalysis ; the housing vibrations were found to be normal.

Finally it was concluded that the probe locations on both the ends was on the repaired and chromeplated area. As the probe works on eddy current principles and chromaplatinig being non-magnetic material, it was pointing out the surface roughness of the magnetic shaft material below the chromalating and thus wrongly giving high displacement values.

Subsequently the location of the probes was shifted to the areas where chromaplatinig was not existing and the vibration values on panel came down.

(D) CONCLUSION :

The turbine DST was done at 7200 rpm on 11th June 1997 at 13.45 hrs.

After coupling ; 101-J Train was again started and taken in line on 12th June 1997 at 16.30 hrs.

- Encl : (1) Annexure-A (3 sheets) Records for 101-JT
- (2) Annexure-B (2 sheets) Records for 101-JLP
  - (3) Annexure-C (2 sheets) Records for 101-JHP
  - (4) Annexure-D Alignment/Coupling Data for 101-JT/101-JLP
  - (5) Annexure-E Alignment/Coupling Data for 101-JLP/101-JG
  - (6) Annexure-F Alignment/Coupling Data for 101-JG/101-JHP

ANNEXURE - A  
RECORDS FOR TURBINE (101-JT)

20  
SHT. 1 OF 3

IFFCO  
KALOL, INDIA

MAY/JUNE 1997

706015/679091

AIR TRAIN REVAMP

101JT

TOTAL FLOAT COVER OFF	4.82 MM	.190"	DESIGN	.170-.190
TOTAL FLOAT COVER ON	4.70 MM	.185"	"	.170-.190
NOZZLE STANDOFF	1.52 MM	.060"	"	.055-.065
END FLOAT	.20 MM	.008"	"	.008-.012
INLET END RADIAL BEARING	.193 MM	.0076"	"	.007-.009
EXHAUST END RADIAL BEARING	.193 MM	.0076"	"	.007-.009

1. REBLADED ROTOR, TR456, INSTALLED.
2. NEW NOZZLE BLOCK, KJZZJK, INSTALLED.
3. NEW 2ND STAGE DIAPHRAGM, KJ-52-EAF-0001, INSTALLED.
4. NEW TURBOCARE DRY COUPLING, PMS 1150 GD, INSTALLED TO 101JLP.
5. NEW COUPLING GUARD, PJD449DA0001, INSTALLED TO 101JLP.

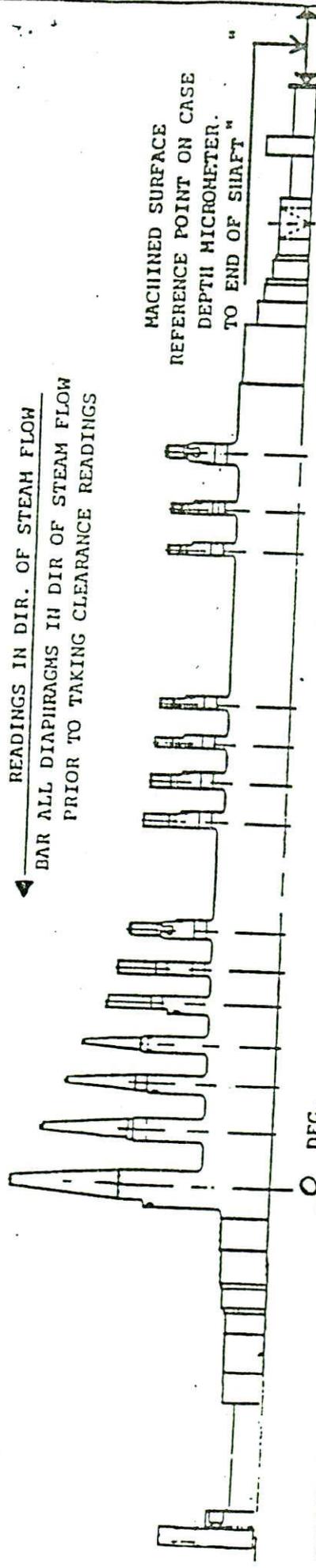
NOTE: ALL DIAPHRAGMS, WITH EXCEPTION OF NEW 2ND STAGE, ARE IN DESPERATE NEED OF REPAIRS TO SEAL FACES, HORIZONTAL JOINTS, SPILL RINGS AND SHOULD HAVE BLADING DRESSED AND POLISHED.  
TIGHT WIRE OR ALIGNMENT BAR REQUIRED AT NEXT SHUTDOWN.

UNIT # 70605/679091 ROTOR # TR 456  
 ASSY. DWG. # H-4483



Delaval Turbine Division

READINGS IN DIR. OF STEAM FLOW  
 BAR ALL DIAPHRAGMS IN DIR OF STEAM FLOW  
 PRIOR TO TAKING CLEARANCE READINGS



MACHINED SURFACE  
 REFERENCE POINT ON CASE  
 DEPTH MICROMETER.  
 TO END OF SHAFT "

ROW	DESIGN CLEARANCES		LEFT SIDE		RIGHT SIDE		LEFT SIDE		RIGHT SIDE		DESIGN CLEARANCE LETTER	DESIGN CLEARANCE MIN.	DESIGN CLEARANCE MAX.	GUARD TYPE	SEAL CLEARANCE	
	MIN.	MAX.	SIIROUD	RASE	SIIROUD	RASE	SIIROUD	RASE	LEFT	RIGHT						
1	.055	.065	.079	.075	.061	.063					E	.013	.019	SEAL	.004	.016
2	.055	.065	.065	.077	.055	.069					E	.013	.019	SEAL	.004	.016
3	.055	.065	.077	.063	.061	.069					E	.013	.019	SEAL	.004	.016
4	.055	.065	.071	.055	.059	.063					E	.013	.019	SEAL	.004	.016
5	.055	.065	.075	.075	.063	.067					E	.013	.019	SEAL	.004	.016
6	.110	.120	.1075	.075	.094	.102					E	.013	.019	SEAL	.002	.016
7	.110	.120	.107	.108	.098	.085					E	.013	.019	SEAL	.008	.007
8	.110	.120	.114	.116	.110	.107					E	.013	.019	SEAL	.004	.016
9											E	.013	.019	SEAL	.004	.006
10											E	.013	.019	SEAL	.010	.010
11											E	.013	.019	SEAL	.004	.010
12											E	.013	.019	SEAL	.004	.008
13											E	.013	.019	SEAL	.016	.076

ACTUAL  
 CPLG. J' BRG. CL. .0076  
 THRUST J' BRG. CL. .0076  
 TOTAL ROTOR FLOAT  
 (W/COVER ON) .185  
 TOTAL ROTOR FLOAT  
 (W/COVER OFF) .190  
 THRUST CLEARANCE  
 (W/COVER TIGHT) .008  
 NOZZLE CLEARANCE .060  
 RUNNING POSITION

RECORDED BY: SITES

CUSTOMER WITNESS: B.C. PATEL

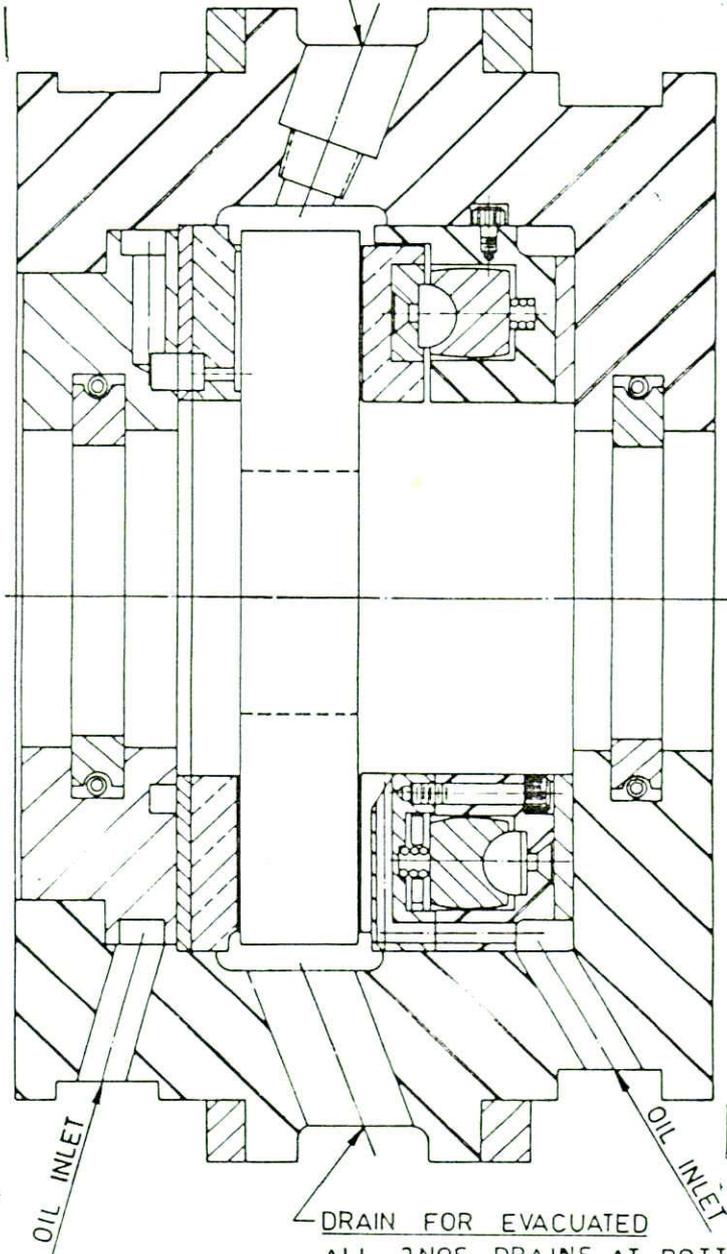
DISASSEMBLE  REASSEMBLE   
 DISASSEMBLE BY CUSTOMER

F.S.R. S.M. HALL

ANNEXURE - A SHT 3 OF 3

DATE : 22.4.97

DRAIN FOR FLOODED CAVITY  
OPERATION ONLY



OIL INLET

OIL INLET

DRAIN FOR EVACUATED  
ALL 3 NOS. DRAINS AT BOTTOM WERE  
PLUGGED

7" Ø THRUST BRG. ASSEMBLY FOR AIR COMPRESSOR  
DRIVE TURBINE (101-JT)

REF. DRG. NO.: D-924-070-005 OF M/S CENTRITECH CORP. USA.

IFFCO  
 KALOL, INDIA

MAY/JUNE 1997

706015/679091

AIR TRAIN REVAMP

101JLP

TOTAL FLOAT COVER OFF	5.85 MM	.230"	
TOTAL FLOAT COVER ON	6.00 MM	.236"	
END FLOAT	.28 MM	.011"	DESIGN .011-.015

REFERENCE WITH 5TH STAGE WHEEL, RIGHT SIDE, SET AT 1.98 MM (.078"), 158.8 MM (6.252") FROM END OF THRUST BEARING BRACKET TO FACE OF THRUST COLLAR.

RADIAL BEARING CLEARANCE DRIVE END .179 MM .007" DESIGN .005-.008  
 RADIAL BEARING CRUSH .013 MM (.0005") WITH .11 MM (.004") SHIM ATOP SHE

RADIAL BEARING CLEARANCE NON-DRIVE END .17 MM .0067" DESIGN .005-.008  
 RADIAL BEARING CRUSH .025 MM (.001") WITH .08 MM (.003") SHIM ATOP SHE

1. NEW 5 STAGE ROTOR, CF4004 D, INSTALLED.
2. ALL COMPONENTS AS LISTED ON CF4000 R INSTALLED
3. REQUIRED DIFFUSER GROOVE FOR CF2054 N, PART 3, MACHINED IN CASE BY CONTINENTAL FIELD SYSTEMS.
4. NEW TURBOCARE DRY COUPLING, PMS 1150 GD, INSTALLED TO 101JT.
5. NEW COUPLING GUARD, PJD 449 DA 0001, INSTALLED TO 101JE
6. NEW TURBOCARE DRY COUPLING, PMS 1150 GE, WAS PROVIDED BUT DUE TO PROBLEMS DURING HUB INSTALLATION, BLOWN O-RING, THE HUB HAD TO BE CUTOFF SHAFT. ORIGINAL ZURN GEAR COUPLING, PH 1626, INSTALLED TO 101JG. NEW COUPLING ORDERED.
7. ORIGINAL COUPLING GUARD INSTALLED TO 101JG INSTEAD OF NEW PJD 449 CM 0001.

IFFCO - KALOL  
101JLP

AIR TRAIN REVAMP  
CF 4000 R

MAY/JUNE 1997  
706015/679091

DIAMETRAL DESIGN	FLUORISINT RINGS		LOOKING TOWARD TURBINE	FLUORISINT RINGS
	LEFT	TOP		
.010-.014	.004	.006	END SEAL	.004 .004
" "	.004	.005	SEAL	.005 .004
.010-.014	.004	.0045	BALANCE RING	.0065 .008
" "	.004	.006	.079 DESIGN	DESIGN .079 .0065 .010
.020-.024	.012	.016	.060 ACTUAL	IMPPELLER ACTUAL .078 .016 .013
.020-.0225	.012	.016	.065 DESIGN	SHAFT DESIGN .065 .017 .012
.020-.024	.012		.110 ACTUAL	IMPPELLER ACTUAL .100 .012 .010
.020-.0225	.010	.019	.125 DESIGN	SHAFT DESIGN .125 .013 .010
.020-.024	.014	.019	.184 ACTUAL	IMPPELLER ACTUAL .172 .012 .011
.022-.0245	.012	.018	.187 DESIGN	SHAFT DESIGN .187 .016 .012
.026-.030	.018	.016	.209 ACTUAL	IMPPELLER ACTUAL .205 .020 .010
.020-.0225	.012	.018	.187 DESIGN	SHAFT DESIGN .187 .016 .012
.026-.030	.018	.018	.219 ACTUAL	IMPPELLER ACTUAL .226 .018 .010
.010-.014	.004	.008	END SEAL	.005 .004
" "	.004	.006	SEAL	.005 .004

ANNEXURE - C  
RECORDS FOR HP CASE COMPR. (101-JHP)

IFFCO  
KALOL, INDIA

MAY/JUNE 1997

706015/679091

AIR TRAIN REVAMP

101JHP

TOTAL FLOAT COVER OFF	4.78 MM	.188"	
TOTAL FLOAT COVER ON	4.97 MM	.196"	
END FLOAT	.25 MM	.010"	DESIGN .008-.012

REFERENCE WITH 8TH STAGE WHEEL, LEFT SIDE, SET AT .76 MM (.030"):  
89.13 MM (3.509") FROM END OF THRUST BEARING BRACKET TO FACE OF  
THRUST COLLAR.

RADIAL BEARING CLEARANCE DRIVE END .10 MM .004" DESIGN .004-.007  
 RADIAL BEARING CLEARANCE NON-DRIVE END .10MM .004" " " "  
 RADIAL BEARING CRUSH, BOTH ENDS, MEASURED AT .000. NO CLEARANCE OR  
 INTERFERENCE.

1. NEW 8 STAGE ROTOR, AF4004 M, INSTALLED.
2. ALL COMPONENTS AS LISTED ON AF4000AR INSTALLED.
3. NEW TURBOCARE DRY COUPLING, PMS 1150 GJ, INSTALLED TO 101JG.
4. NEW COUPLING GUARD, PJD 449 DD 0001, INSTALLED TO 101JG.

NOTE: ON DWG D-75916, SYMBOL PJ-5014 EK, DETAIL "B"  
 O-RING PART #3 HAS INCORRECT SYMBOL NUMBER.  
 SYMBOL # 820430 IS TO 816 FOR THIS APPLICATION.  
 NEW SYMBOL OF CORRECT O-RING REQUIRED.

IFFCO - KALOL

AIR TRAIN REVAMP

MAY/JUNE 199

AF 4000 AR

706015/67909

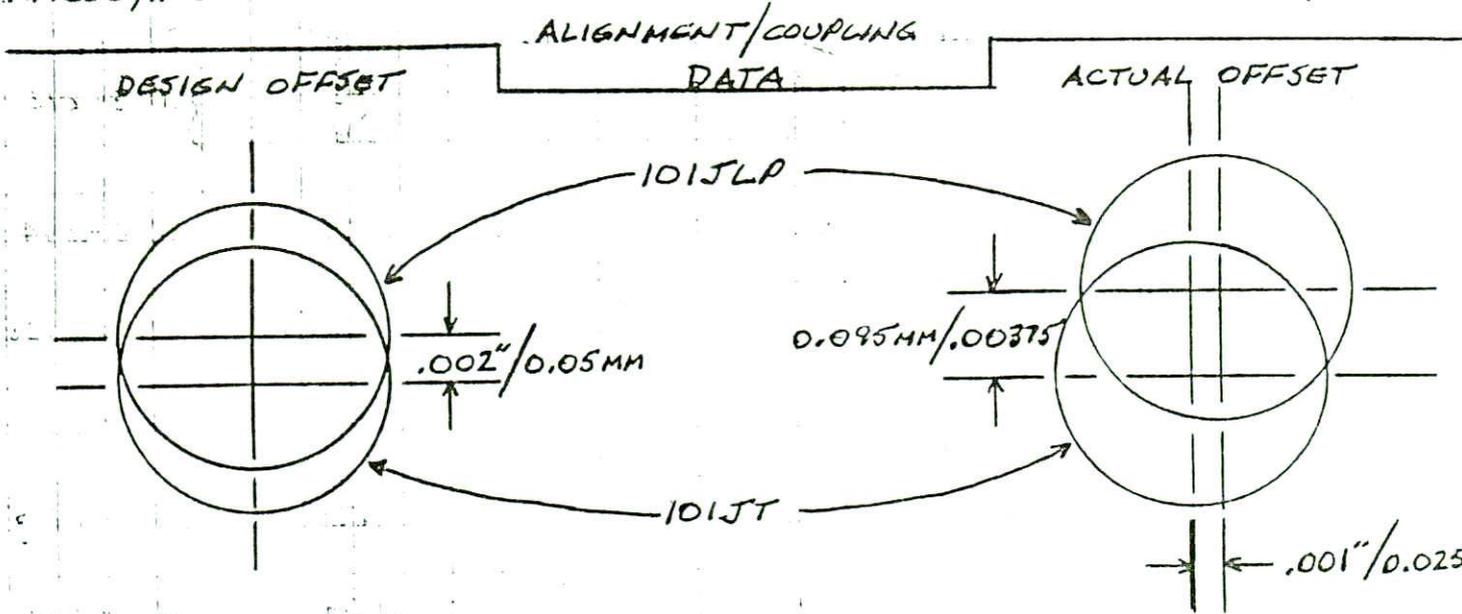
101 JHP  
DIAMETRAL  
DESIGN

LEFT

RIGHT

LEFT			RIGHT
.008-.012	.002	END SEAL	.004
" "	.002		.004
" "	.003		.003
" "	.003		.003
.010-.014	.004	IMPPELLER	.004
.010-.0125	.004	SHAFT	.0025
.010-.014	.006	IMPPELLER	.004
.010-.0125	.003	SHAFT	.0025
.010-.014	.003	IMPPELLER	.003
.010-.0125	.003	SHAFT	.003
.010-.014	.0025	IMPPELLER	.004
.010-.0125	.003	SHAFT	.003
.010-.014	.003	IMPPELLER	.004
.010-.0125	.003	SHAFT	.003
.010-.014	.004	IMPPELLER	.004
.010-.0125	.003	SHAFT	.003
.010-.014	.004	IMPPELLER	.003
.010-.0125	.003	SHAFT	.003
.010-.014	.003	IMPPELLER	.003
.008-.012	.004	BALANCE RING	.004
" "	.0025		.003
.008-.012	.003	END SEAL	.004
" "	.003		.004
" "	.0025		.004
" "	.0025		.004





- NOTE :
1. REVERSE INDICATOR METHOD NOT USED. FACE AND RIM ONLY
  2. ALIGNMENT DATA BY GANGOTRI TURBO TECH. ENGG. SERVICES
  3. FACE READINGS (PARALLELISM) SHOW FACES OPEN ON LEFT SIDE AND BOTTOM BY .0016" (0.04 MM).
  4. LOOKING FROM TURBINE TO COMPRESSOR
  5. DIAL INDICATORS READING ON COMPRESSOR HUB.
  6. ALIGNMENT AND METHOD ACCEPTED BY D. HANDAR - IFFCO.

TURBOCARE DRY COUPLING

DDTC - PMS 1150GD

101JT

COUPLING HUB DRIVE

.474" DESIGN .458"-.488"  
12.05MM " 11.63MM-12.4MM

HUB DRIVEN PAST END OF SHAFT

.061" 1.55MM

FLANGE TO FLANGE SPACING

SPACER LENGTH

PRESTRETCH (DESIGN)

8 SHIMS (.06" EACH - 4 EACH SIDE)

PRESTRETCH (ACTUAL)

101JLP

COUPLING HUB DRIVE

.460" DESIGN .458"-.488"  
11.7MM " 11.63MM-12.4MM

HUB DRIVEN FLUSH WITH END OF SHAFT.

9.529"

242.04 MM

- 9.315"

- 236.60 MM

+ .214"

5.44 MM

- .085"

- 2.16 MM

+ .129"

3.28 MM

- .120"

- 3.05 MM

.009"

.23 MM

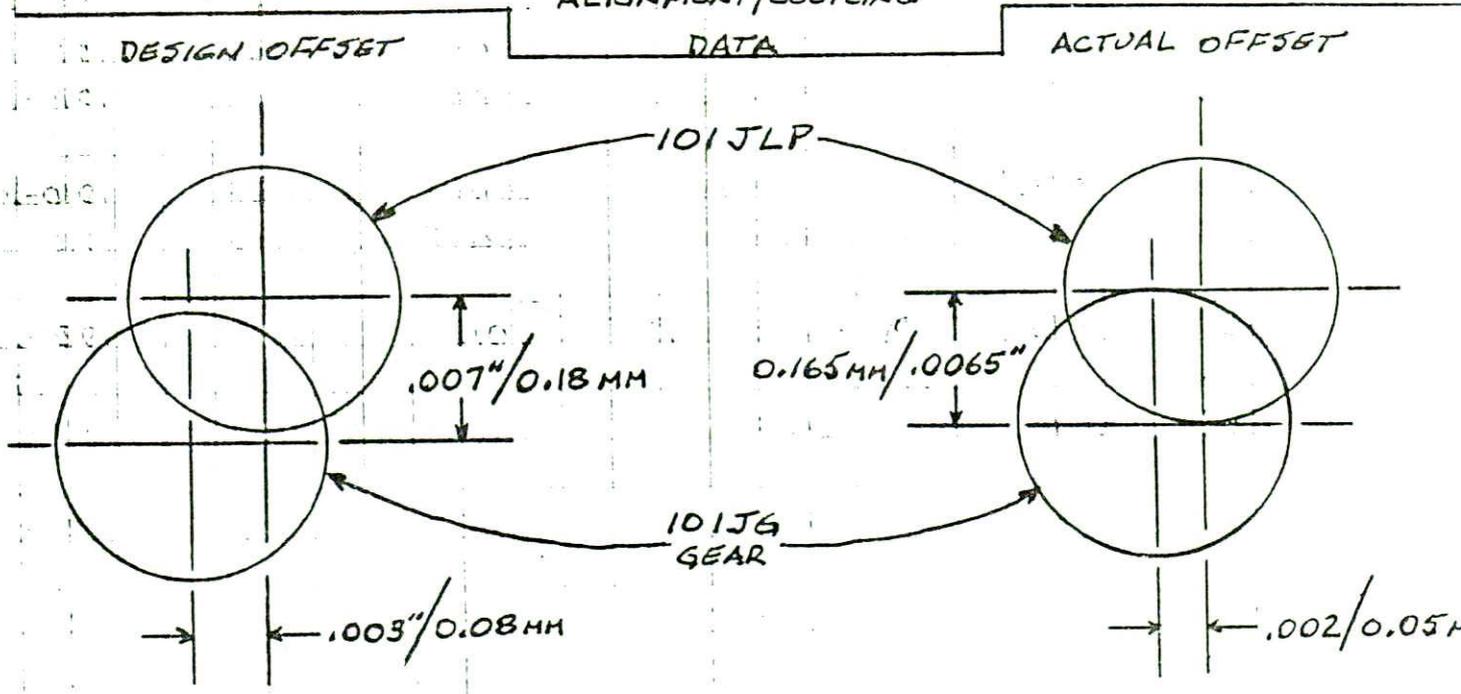
.094"

2.39 MM

IFFCO  
KALOL, INDIA

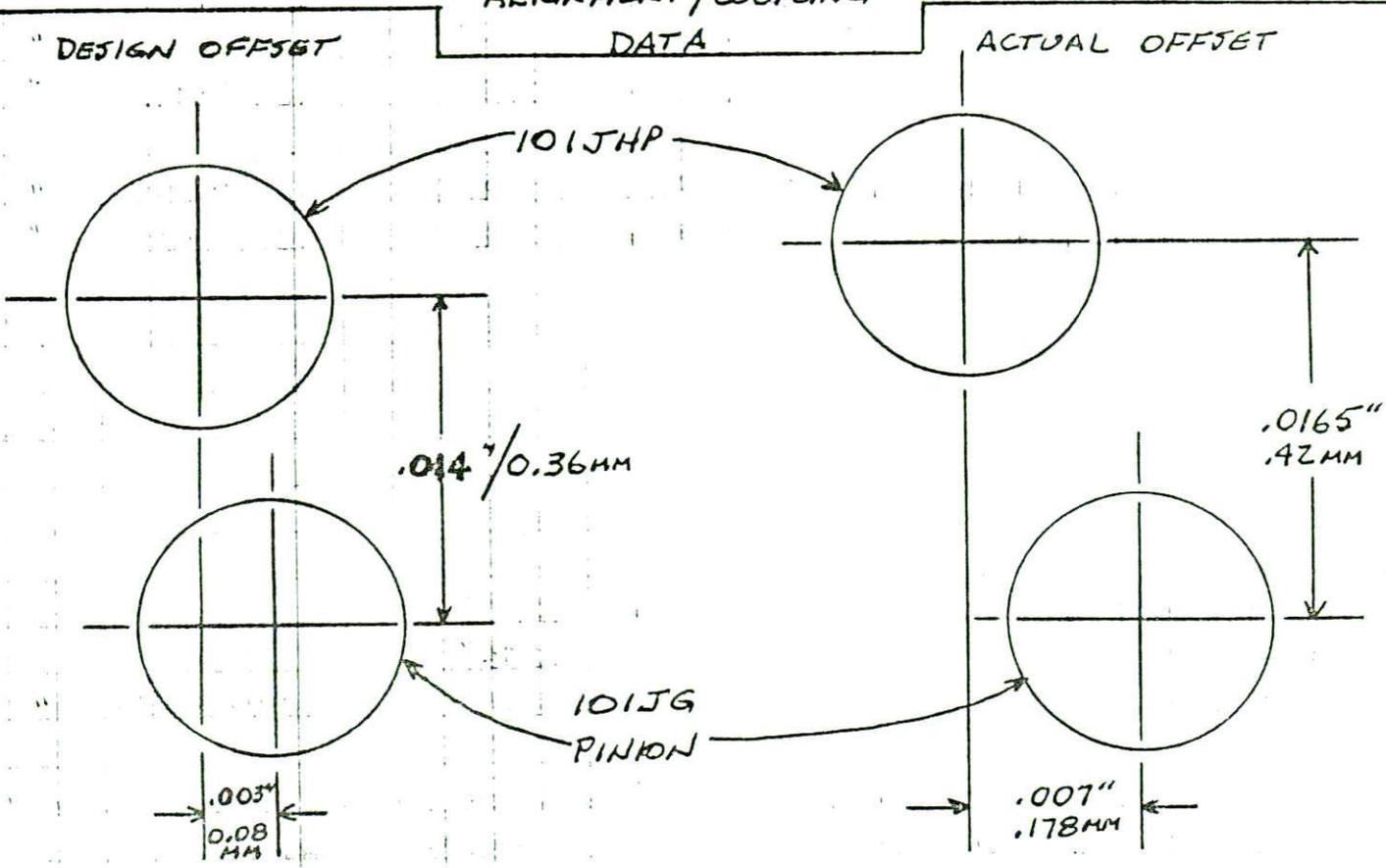
AIR TRAIN REVAMP

ALIGNMENT/COUPLING  
DATA



- NOTE:
1. REVERSE INDICATOR METHOD NOT USED. FACE AND RIM ONLY.
  2. ALIGNMENT DATA BY GANGOTRI TURBO TECH. ENGG. SERVICE
  3. FACE READINGS (PARALLELISM) SHOW FACES OPEN ON RIGHT SIDE .002" (0.05MM) AND TOP .0018" (0.046MM).
  4. LOOKING FROM COMPRESSOR TO GEAR.
  5. DIAL INDICATORS READINGS ON GEAR HUB;
  6. ALIGNMENT AND METHOD ACCEPTED BY D. INAMDAR-IFFCO.

ZURN GEAR COUPLING	DDTC - PM-1626
101JLP	101JG - GEAR
COUPLING HUB DRIVE	KEYED HUB
.231" DESIGN .214"-.244"	.002"-.003" INTERFERENCE FIT
5.88MM " 5.44MM-6.20MM	0.05MM-0.076MM "
HUB EXTENDING FROM END OF SHAFT	HUB FLUSH WITH END OF SHAFT
.118" 3.00MM	
HUB TO HUB SPACING	8.132" 206.55 MM
SHROUD/SPACER FLOAT	.350" 8.75 MM (APPROXIMATE)
DESIGN FLOAT	.300" 7.62 MM



- NOTES: 1. REVERSE INDICATOR METHOD NOT USED. RIM AND FACE ONLY.  
 2. ALIGNMENT DATA BY GANGOTRI TURBO TECH. ENGG. SERVICES.  
 3. FACE READINGS (PARALLELISM) SHOW FACES OPEN ON RIGHT SIDE AND BOTTOM .001" (.025MM).  
 4. LOOKING FROM PINION TO COMPRESSOR  
 5. DIAL INDICATORS READING ON PINION HUB.  
 6. ALIGNMENT AND METHOD ACCEPTED BY D. J. NAHDAR - IFFCO.

TURBOCARE DRY COUPLING  
 101JG - PINION  
 KEYED HUB  
 .0023" INTERFERENCE FIT  
 0.058MM  
 HUB EXTENDING .024" (.61MM)

DDTC - PMS 1150 GJ  
 101JHP  
 COUPLING HUB DRIVE  
 .290" DESIGN .286" - .316"  
 7.36MM " 7.26MM - 8.03MM  
 HUB EXTENDING .015" (.38MM)

FLANGE TO FLANGE SPACING	8.583"	218.01 MM
SPACER LENGTH	- 8.424"	- 213.97 MM
"	.159"	4.04 MM
PRESTRETCH (DESIGN)	- .029"	- .74 MM
"	.130"	3.30 MM
8 SHIMS (.015" EACH - 4 EACH SIDE)	- .120"	- 3.05 MM
"	.010"	.25 MM
PRESTRETCH (ACTUAL)	.039"	0.99 MM

JOB CODE            JOB DESCRIPTION

30

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

During the turnaround : NG Compressor was taken for major overhauling. Following jobs were done during the major overhauling of the compressor.

N.G.COMPRESSOR (102-J) :

- the compressor was decoupled from the turbine.
- the suction and discharge pipings were disconnected.
- the seal oil/seal gas/lub oil pipings were removed.
- all instrument connections were removed.
  
- the foundation bolts were removed and casing (barrel) was removed from position and loaded into truck for shifting to workshop for overhauling.
  
- both the end covers of the barrel were loosened in workshop.
  
- the coupling hub was removed from rotor.
- both the journal bearings the thrust bearing were removed.
  
- both the oil seal assemblies were removed.
- both the end covers were removed and the bundle assembly was pulled out alongwith the rotor from the barrel.
  
- the rotor assembly was removed after splitting the bundle.
  
- the rotor was found damaged in HP oil seal areas and hence it was decided to replace the rotor with the spare one.
  
- the spare rotor was drawn from the stores and was checked for the sizes and found to be O.K.
  
- the labyrinth clearances were checked in both the halves of the diaphragm and found to be okay., hence were not replaced.
  
- both the H.P.seals were found in damaged condition hence were replaced.
  
- the assembly of the barrel was completed in the workshop.
  
- the thrust bearing clearances and rotor position were set for the new rotor assembly.

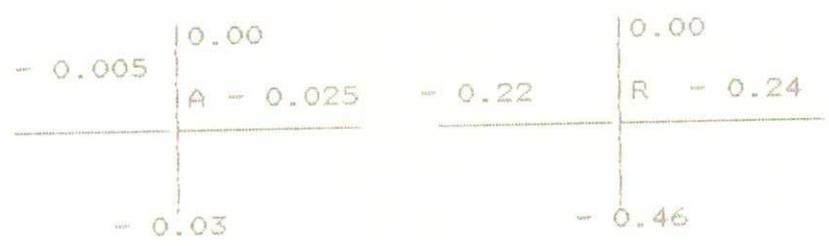


Following are the details of overhauling.

Journal bearing clearances :

Front - journal dia : 79.86 MM / clearance 0.20 MM  
Rear - journal dia : 99.86 MM / clearance 0.14 MM

Alignment reading : (Dial on compressor )



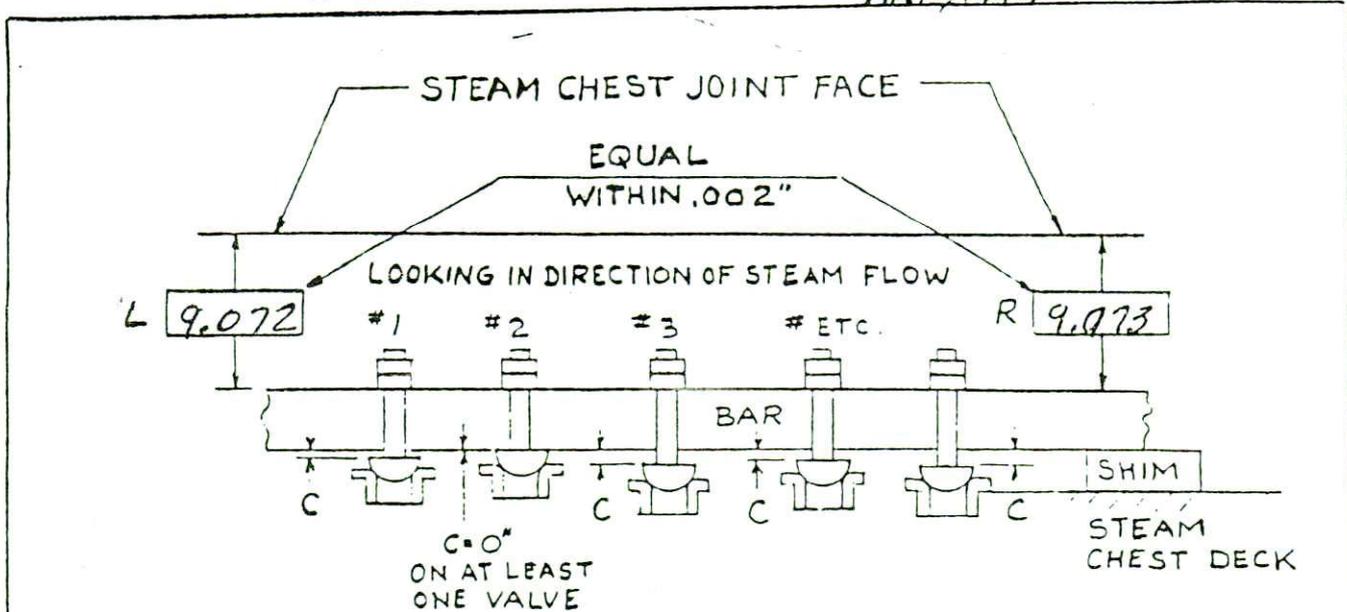
01 01 03 103-JAT SYN.GAS COMPRESSOR DRIVE BACK PRESSURE TURBINE:

The major job to be done in the 103-J train was the replacement of the steam chest cover alongwith the new modified spindles, valves, valve bar, gland housing etc.

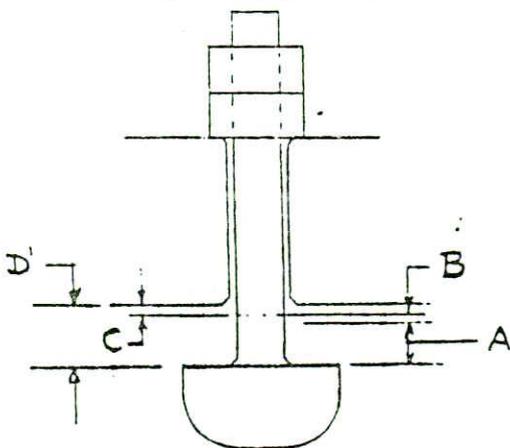
REPLACEMENT OF THE STEAM CHEST COVER FOR 103-JAT :

The Ammonia plant was stopped on 12th May 1997 and after putting blind in the exhaust line of 103-JAT. Following jobs were done on 103-JAT.

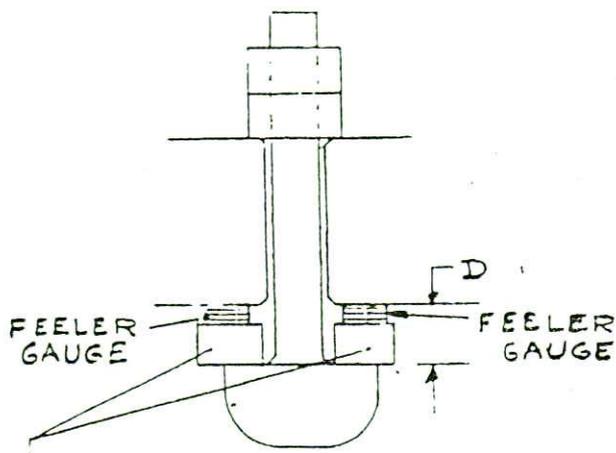
- removed the fastners of the steam chest cover, disconnected the linkage from the servomotor and measured the cold bar setting clearance as 0.080".
- the steam chest cover assembly alongwith the lever, valve assemblies was removed from the position and kept on wooden slippers and empty oil drums.
- the complete valve assembly was dismentled.
- the new steam chest cover was kept on drums and wooden slippers.
- the new valve assembly was made from the new valves and old valve bar.
- for the center valve, the pilot valve was set for 0.180" by machining the top nut.



SKETCH #1



SKETCH #2



STANDARD GROUND BLOCKS OR BARS OF EQUAL HEIGHT, AS NECESSARY "MIKED" STACKUP DIMENSIONS OF EACH SIDE TO BE WITHIN .005" OF EACH OTHER.

VALVE NUMBER		1	2	3	4	5	6	7
VALVE SETTING	A	.900	.460	.100	.680	1.180		
COLD BAR CLEAR.	B	.100	.100	.100	.100	.100		
VALVE TO BAR CLEARANCE	C	.022	.023	0	.040	.014		
TOTAL	D	1.022	.583	.200	.720	1.294		

STEAM CHEST COVER, VALVE, LIFTING BAR, PACKING STANDS & SPINDLES RENEWED

				IFFCO - KALOL, INDIA
				103 JAT SYNGAS TRAIN
4/27/61	REC	VS	As per d	706012
DATE	CK. BY	APP'D.	ALTERATIONS	DE LAVAL STEAM TURBINE CO. TRENTON, N. J.
				EDP-1997

Fig. 10-29 Turbine Nozzle Valve Adjustment Form 10-63/6

JOB CODE	JOB DESCRIPTION	34
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- the valve assembly was lowered in the steam chest in position and paralleled so that the valve (centre one), matching the highest level valve seat, seats on it. This way the valve seating error for rest of the valves was noted down.
- the blue match for all the valves was taken with their respective valve seats and was found to be reasonably good.
- the new chest cover was not having one leak off hole for gland steam leak off, hence the same was taken to workshop and a hole for gland leak off was drilled as per the adjacent gland housing.
- the chest cover was brought back from the workshop and again placed on empty oil drums and wooden slippers.
- all the five valves were assembled in the valve bar and their adjustments were made as per the valve seating errors found for each of the valves (See Annexure-A)
- both the spindles were placed in their position and gland housings were boxed up.
- the valve assembly was assembled with the spindles and the clearances for the washers and spacer sleeves were kept as per the requirement.
- the spindles were checked for parallalism and found to be within the acceptable limit of 0.04 MM.
- the valve operating lever assembly was placed into position and linked with the spindles. The brackets were not tightened and kept loose for alignment with spindles.
- after the bracket / lever / spindles were aligned ; both the brackets were tightened and their dowels were placed into position after drilling holes in their respetive positions.
- the position of the valve bar assembly w.r.t. the centerline of lever keeping the lever exactly horizontal was maintained as per the requirement. (457 MM) and the lock nut for spindle were tightened.
- the complete assembly was again brought back from workshop and installed in its respective position on the steam chest.
- the lever was aligned with the servomotor and the steam chest cover was tightened.

JOB CODE

JOB DESCRIPTION

35

- after tightening the cover ; the same was dowelled to the steam chest.
- after keeping the cold bar clearance of 0.100" the lever was linked with the seromotor of PRC-12.

Apart from the steam chest cover replacement job on 103-JAT ; following jobs were done in 103-J train.

- both the journal bearing clearances were checked in 103-JAT & found to be O.K.
- the TTV of 103-JAT was overhauled.
- the TTV of 103-JBT was overhauled.
- all the couplings were opened, cleaned and boxed up.
- the 103-JLD turbine was opened for overhauling, both the bearings were replaced ; governor was calibrated and reinstalled ; alignment was carried out at both the ends and the turbine was coupled with both the pumps.
- the " Six way valve " for the isolation of filters was replaced by a new spare one procured from M/s.Dresser Rand , USA.
- L.O.filters were replaced.

#### 01 01 04 REFRIGERATION COMPRESSOR TRAIN (105-J TRAIN) :

The main job to be done in 105-J train was the major overhauling of the drive turbine i.e. 105-JT and fixing of S.S.inserts in the turbine casing. The fixing of S.S.inserts in eroded diaphragm seating areas was to be carried out in-situ by M/s.Continental field services,USA under M/s.DDTC Supervision.

#### OVERHAULING & IN-SITU MACHINING IN 105-JT :

Following jobs were carried out during 105-JT overhauling.

- the turbine was decoupled from LP case.
- the exhaust bend, piping, bellow etc. were loosened and removed.
- the casing bolts were loosened and the casing alongwith the steam chest cover assly. was removed with the help of crane.
- the rotor and diaphragms from the bottom halves were also removed.

JOB CODE

JOB DESCRIPTION

36

- the top half of the casing was reversed and the diaphragm halves from top half were removed.
- the CFS people did the machining job in both the halves separately one after the other.
- they did machining in following stages.
  - a) Setting up the boring bar, dummy bearings, support brackets etc. in the casing half.
  - b) Setting of the tool.
  - c) Rough machining of the eroded grooves in the casing half one by one.
  - d) Grooving for fixing of S.S.inserts in groove No.3,4,5 & 6.
  - e) Fixing of S.S.inserts in the above grooves.
  - f) Welding of S.S.inserts.
  - g) Cutting of extralength of S.S.inserts.
  - h) Final fixing the position of diaphragm seating as per the protocol and maintaining the gap of 0.750" (+ 0.004" - 0.000") for fixing respective diaphragm.
  - i) Measuring the gap of 0.750" ( + 0.004" - 0.000" ) and the distance of the diaphragm seating surface to end of the casing as per the protocol.
  - j) Removal of tooling, dummy bearings and support brackets from the casing half.
  - k) Clearing of debris from the casing.

the machining of started on 16/05/97 and was completed on 24/5/97
- the removed diaphragms were inspected and found to be severely eroded (especially dia nos 3,4,5 & 6) hence it was decided to use spare reconditioned diaphragms which were in better shape than the removed ones.
- the rotor and diaphragms were cleaned by dry sand blasting.
- after placing all the diaphragms in position ; the rotor was placed in the bottom half and total float was checked.

JOB CODE                      JOB DESCRIPTION

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- total float was found as 0.079" which was less than the design. Hence all new diaphragms were checked and diaphragm # 3 was found having thickness more by 1/4". The spare (new) diaphragm was having symbol no. KJ-BBB instead of KJ-52BBB hence the same was removed and the old removed diaphragm was reinstalled.
- again the total float was checked and was found to be within the acceptable limits.
- nozzle clearance was checked.
- thrust bearing (end play) clearance and journal bearing clearance was checked.
- the labyrinth clearances were checked. (See Annexure-A)
- the upper half casing alongwith the diaphragms was placed into position and tightened.
- again the total float, nozzle clearance, end play were taken and accordingly shims were made in the workshop for the thrust bearing.
- the cold bar setting of governing valve was adjusted to 0.100" and the valve was linked with the servomotor.
- the exhaust line piping and bellow were placed into position.
- as part of 38 ata steamline was replaced by project group the steam inlet line to the turbine was disconnected and steam blowing was done in the same.
- after steam blowing was over, the line was connected to the turbine steam inlet.

During start-up of the 105-JT turbine after overhauling for over speed trip testing ; it was observed that on latching the turbine, the hydraulic oil was not entering the servomotor to open the control valve and the control valve was not operating at all.

Hence the main steam valve was closed and the turbine was isolated to check the control valve. Following jobs were done.

- the pilot valve was replaced.
- the clearances between pilot valve & pilot sleeve were checked & found to be OK
- the servomotor linkages were checked and surprisingly it's settings were found disturbed.



JOB CODE

JOB DISCRIPTION

39

- the settings of the servomotor of 101-JT which is identical to 105-JT were checked and found to be as per drg. The same setting were set for 105-JT and thereafter the control valve opened and machine was rolled.
- turbine OST was carried out at 7270 rpm.

Apart from the 105-JT overhauling following jobs were done in 105-J Train.

#### 105-JR GEAR BOX :

The gear box was opened cleaned and its bearing clearances were checked and found to be as follows :

Gear LP end journal bearing	: 0.0098"
Gear HP end journal bearing	: 0.0091"
Pinion LP end journal bearing:	0.0094"
Pinion HP end journal bearing:	0.0098"
Gear end play	: 0.011"

- all the three couplings were cleaned and boxed up.
- all the sour oil traps were cleaned and boxed up.

#### 01 02 01 BOILER FEED WATER PUMP'S DRIVE BACK PRESSURE TURBINE (104-JT) :

The Elliot turbine (104-JT) for boiler feed water pump was to be removed from position, it's casing was to be turned upside down and the steam leakage from the condensate drain point of the casing was to be attended. Hence, the turbine was decoupled from the pump and all steam leak off lines, oil inlet / outlet lines, drain lines etc. were removed near the leakage area. After removal of these lines it was tried to weld the drain point without removing the turbine from position. As the welding could be done successfully, the idea of removal of turbine casing from the position was dropped.

However during inspection of the front end journal bearing, the bearing was found in badly damaged condition. The journal area of the rotor was also badly damaged hence it was decided to open the turbine for replacement of rotor. Following jobs were done during overhauling.

- turbine exhaust was removed.
- casing top half was removed.
- governor was removed.
- rotor was removed.
- spare rotor was drawn from the stores & inspected.

JOB CODE

JOB DISCRIPTION

40

- spare rotor was installed and the turbine was assembled with new carbon rings for interstage and gland sealing and the new journal bearings.
- the turbine exhaust line was connected.
- the governor was installed.
- the turbine was run on solo and OST was carried out at 4100 rpm.
- the lub oil filter for the turbine was replaced.
- the L.O.Cooler of the turbine was cleaned, it's oil was replaced.

During start-up it was observed that its pump was not responding to sudden load changes (like in case of a changeover). The reason was that governor was not responding and was also hunting during normal operation the same was changed and replaced with spare one duly calibrated.

#### BOILER FEED WATER PUMP (104-J) :

Following jobs were done on the BFW pump (104-J)

- both the bearings were inspected and found O.K.
- the oil from the sump for gear pump assly was completely replaced.
- Seal coolers were cleaned thoroughly and assembled back.

After assembling these coolers the turbine was coupled with the pump and the pump was handed over to production.

#### 01 02 02 BOILER FEED WATER PUMP DRIVE CONDENSING TURBINE (104-JAT) :

This turbine was opened for major overhauling, following jobs were done during overhauling.

- turbine was decoupled from pump side.
- it's exhaust bellow was removed, bend was removed.
- the casing was removed.
- the diaphragms were removed after noting down the total float, end play etc.
- Journal bearing clearances were checked.
- the rotor was removed and inspected. During inspection it was found having crack in one shroud segment of the last wheel hence it was decided to replace the same by spare rotor.

JOB CODE                      JOB DISCRPTION 41

- the spare rotor was drawn from stores, its balance check. Run was carried out on balancing machine and was found to be O.K.
- the same was used for turbine assembly.
- all the interstage labyrinths which were bolted to diaphragms were removed by drilling the screws.
- the new screws were procured and diaphragms were assembled with new labyrinths.
- the turbine assembly was then made with the spare rotor.
- the bearing clearances of both the journal bearings were checked and found to be O.K.
- the end play of the turbine rotor was adjusted.
- the governor was replaced with spare one for attending the oil seal leakage.
- the oil sump for the turbine was thoroughly cleaned and fresh oil was charged in the same.
- the oil coolers were cleaned thoroughly from cooling water side.

After completing all these jobs 104-JAT was run in decoupled condition and DST was done at 4100 rpm.

The turbine was then coupled with the pump and handed over to production.

During start-up, it was observed that the turbine is not delivering full load. The TTV was opened and checked, the governing valve, it's strainer etc. were checked for any fouling, the governing settings were checked and found to be okay. Finally it was observed the turbine was latched from the latch knob and started lowever the TTV was not latched and hence was not passing through the full quantity of steam thus making turbine delivering less lead.

The TTV was properly latched and it was ensured for proper latching when the latch knob is pressed. The turbine was then run and could take the full load.

**BOILER FEED WATER PUMP (104-JA) :**

Following jobs were done in BFW pump 104-JA.

JOB CODE            JOB DISCRIPTION

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- the mechanical seal of coupling end was removed for taking dimensions for indigenisation of the same by M/s.Duramettalic. The same was boxed up after taking the dimensions.
- the journal bearing clearances were checked and found to be O.K.
- the end play was checked and found to be O.K.
- the seal coolers were cleaned.
- the oil from the oil sump for oil pump was completely drained and fresh oil was charged.

01 02 03 MEA PUMP DRIVE CONDENSING "MURRAY" TURBINE (107-JT) :

Murray turbine was taken for major overhauling during the turnaround. Following jobs were done during its major overhauling.

- the exhaust piping & bellow were removed.
- turbine was decoupled from pump.
- the casing upper halve was removed.
- the bearing clearnaces were checked.
- the rotor end play, nozzle clearance, total float were checked and noted down.
- the oil pump assembly and governor assly. were removed.
- the rotor was removed.
- the old stationary segments were also removed as their blades were found severely eroded.
- the new stationary segments were installed as the old one was having eroded blades. The segments were having modified design blades with No. of blades 34 & 23 in place of 53 & 35. However the total open area of the sector was the same.
- the condition of the old diaphragms was found to be good hence the same were not replaced by the new ones.
- the carbon rings were replaced with new ones.
- the casing was boxed up after adjusting and measuring the rotor axial positions.
- the governor, oil pump assembly , bearing etc.were also assembled.
- the exhaust bellow was placed into position.
- the turbine was put on slow roll and the speed was increased slowly for OST test.
- the turbine OST was done at 4100 rpm.
- then the turbine was stopped and coupled with the pump and started again.

ANNEXURE: A

MAY 1997

RECOMMENDED CLEARANCES									
		D1 = 0.004" TO 0.006"	B1 = 0.0075" TO 0.010"	C = 0.012" TO 0.016"					
		D2 = 0.004" TO 0.006"	B2 = 0.0044" TO 0.007"	E = 3/32"					
			A = 0.007" TO 0.013"	F = 1/16"					
AFTER	BEFORE	AFTER	BEFORE	STEAM FLOW		BEFORE	AFTER	BEFORE	AFTER
				↓			0.005"		
				THRUST BRG. A					
				BEARING D1			0.006"		
				CARBON RING B1			0.008"		
				B1			0.008"		
				B1			0.008"		
				B1			0.008"		
				B1			0.009"		
				B1			0.010"		
		0.082"	0.062"	NOZZLE					
				F					
				WHEEL-1					
				WHEEL-2					
		0.035"	0.032"	DIAPHRAGM C			0.012"		
				E					
				WHEEL-3					
		0.100"	0.032"	DIAPHRAGM C			0.012"		
				E					
				WHEEL-4					
		0.032"	0.032"	DIAPHRAGM C			0.012"		
				E					
				WHEEL-5					
		0.035"	0.032"	DIAPHRAGM C			0.012"		
				E					
				WHEEL-6					
				CARBON RING B2			0.007"		
				B2			0.006"		
				B2			0.006"		
				B2			0.006"		
				B2			0.004"		
				B2			0.004"		
				B2			0.004"		
				BEARING D2			0.006"		
				COUPLING		TOTAL FLOAT → 2.9 MM	2.8 MM		

107JT MURREY TURBINE

JOB CODE                      JOB DISCRIPTION

44

- However the turbine front end bearing housing vibrations were found increasing from 25 microns to 250 microns in horizontal direction and was further having an increasing trend at the same 3300 rpm. and the turbine's trip valve lever got delatched due to vibrations and the pump tripped.
- the TTV and the governing valve were opened ; the governing valve and it's stem were replaced with new one and were boxed up.
- the turbine was again started however the vibrations still persisted hence it was again stopped.
- it was decided to replace the new sector installed with the old one and hence again the turbine was opened and the old sector was reinstalled.
- after boxing up the turbine, again the pump was started however the vibrations still persisted hence it was decided to replace the turbine's rotor and again the turbine was opened. spare rotor was drawn from stores, its balancing was checked in the workshop and the same was installed.
- again on starting the pump; the vibrations were found very high.
- on further diagnosis it was found that the spring support below the steam inlet line of the turbine was not loaded at all. This line was removed by L&T for steam blowing purpose during shutdown and since then probably the support was lying in the same condition.
- the spring support was adjusted to take up the load and the vibration drastically came down to 18/20 microns. The turbine was then handed over to production. Following were the other jobs done on the turbine during shutdown.
- oil filter was replaced with new one.
- oil was replaced.
- the oil cooler was cleaned.

Following are the records maintained.

Total float	-	2.8 MM
Thrust brg. clearance	-	0.008"
Journal brg. clearance	-	0.006" on both ends.
Nozzle ring clearance	-	0.082"
Active side shim thickness	-	0.779"
Inactive side shim thickness	-	0.211"

( For clearance See Annexure-A)

JOB CODE

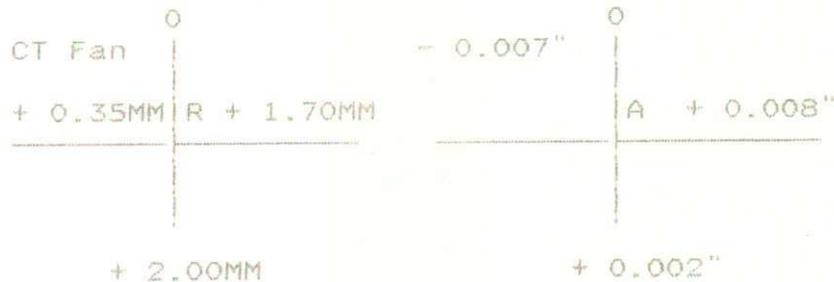
JOB DISCRIPTION

45

01 02 04 102-J LUB OIL PUMP DRIVE TURBINE (102-JLT) :

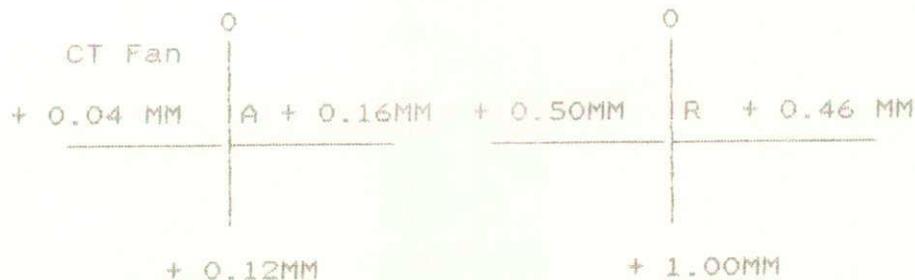
- the turbine was decoupled from pump and its governor was removed from position.
- both the bearings (i.e. SKF 6309 : 2 Nos) were replaced with new ones.
- all the carbon rings were replaced and a clearance of 0.001" to 0.003" was kept for each of them on diameter.
- the governor was replaced with spare calibrated one.
- the turbine rotor float after assembly was checked and found to be 0.10 MM.

Following was the alignment reading kept between turbine and pump.



01 02 05 102-J SEAL OIL PUMP DRIVE TURBINE (102-JST) :

- turbine was decoupled from pump.
- governor was removed.
- both the bearings were replaced with new one.
- all carbon rings were replaced with new ones and 0.001" to 0.003" diametrical clearance was kept for each of them.
- Following alignment reading was kept for the pump and turbine. (Dial on turbine)



JOB CODE            JOB DISCRIPTION

46

01 03 01 I.D.FAN (101-BJ) :

I.D.Fan was decoupled from gear box and following jobs were done.

- both the journal bearings were opened and clearances checked.
- the gear box oil was drained and fresh oil was charged.
- the oil coolers were opened cleaned.
- both the couplings were greased.

Following are the details of overhauling.

West side journal brg.clearance : 0.012" - 0.013"  
East side journal brg.clearance : 0.008" - 0.009"

I.D.FAN DRIVE TURBINE (101-BJT) :

The turbine was taken for major overhauling and following jobs were carried out.

- all the carbon rings were replaced.
- thrust bearing SKF 6310 was replaced.
- both the journal bearing clearance were checked and found to be O.K.
- the governor oil was flushed.

Following are the details of the job done.

Journal bearing clearances :

Rear End     : 0.008"  
Front end    : 0.009"

01 12 01 PRIMARY REFORMER (101-B) :ARCH BURNER REPLACEMENT :

Old burners of the primary Reformer furnace (101-B) were originally supplied by M/s.National Air Oil Burner Company, USA. These burners were of flat flame design. The capacity of this burners (0.85 Kcal/hr.per burner) was not sufficient for achieving a proposed plant capacity of 1100 MTPD. Hence it was decided to replace these burners with higher efficiency round flame pattern Jhon Zinc burners. The type and other details of these burners are given in the Annexure-A.

Performance

Burner Duty:

<u>Design</u>	<u>mm kcal/hr</u>	<u>Mixed Gas</u>	<u>Naphtha</u>	<u>Total</u>
Case 1		1.25	-	1.25
Case 2		-	1.25	1.25
Case 3		0.25	1.0	1.25
Case 4		0.65	0.60	1.25
Normal				0.95
Minimum				0.45

Excess air: 10%

Naphtha pressure at burner: 9 kg/cm<sup>2</sup>g

Atomising steam pressure: 2.5 kg/cm<sup>2</sup>g  
 (if higher pressure is available, better performance can be achieved)

Air pressure loss: 5 mm wg

Flame dimensions - length: 2.5 - 3m )  
 - diameter: 0.75m ) at max.

Atomising steam consumption: 0.30 - 0.35 kg/kg  
 at design increasing  
 (kg/kg) as burner is turned down

Fuels: Liquid naphtha  
 LHV - 10552 kcal/kg  
 SC = 0.69 - 0.73

Fuel gas: Associated gas:  
 LHV - 9607 - 8774 kcal/sm<sup>3</sup>  
 Temperatures - 50 - 80°C  
 Pressure at design duty -  
 1.5 kg/cm<sup>2</sup>g

Tail gas:  
 LHV - 3000 kcal/sm<sup>3</sup>  
 Temperatures - 50 - 80°C  
 Pressure at design duty -  
 1.5 kg/cm<sup>2</sup>g

Max. flow = 3150 sm<sup>3</sup>/hr (total)

Turndown: Naphtha: 3 to 1  
 Gas: 5 to 1

Steam conditions: Slightly superheated

JOB CODE

JOB DISCRIPTION

48

REMOVAL ACTIVITIES OF BURNERS ALONGWITH BURNER BLOCKS :

- All guns were removed after purging the system.
- Steam lines were cut and removed as per site requirement.
- Naphtha lines were disconnected from bottom & top elbows.
- A.G.lines were cut at bent portion. Pilot gas lines were removed permanantly.
- After cleaning all above three lines, the space above burner was free. The bolts between burner support plate and burner frame were cut. Burner and burner blocks were held with the help of wire rope while cutting.
- After cutting bolts, old burners with burner blocks were shifted to east site platform in the pent house. From here, rope pulley arrangement was made to bring down burners with burner block to ground floor.
- Line removal and burners with blocks were removed simulteneously.

ARCH PLATE CUTTING :

After removal of burners, Arch plate were cut by 4" in E.W direction to make an opening of 21 " x 21" size against existing size of 17" x 21" to accomodate bigger burner blocks. Cutting work was done by Plasma Arc cutting and with electrodes. A template was made for marking the burner position for cutting.

SHIFTING OF SUPPORT FRAME :

During installation of new burner frames, it was found that existing gap between frames were not sufficient to accomodate new burner support plates, So it was decided to cut frame on one side by 20 mm to make a gap of 580 mm against existing 560 mm leaving a clearance of 10 mm between burner support plate and frame.

JOB CODE

JOB DISCRIPTION

49

HEADER SHIFTING :

New burners having safety interlock device were fauling with Pigtaills. Hence it was decided to change orientation of gun by 30 deg. Due to change in orientation of burners, all existing pipe lines were not matching with the burner connections. Because of this we were left with two options :

- (i) To give a bend in connected lines which required more piping and thus increasing fabrication job.
- (ii) To shift the steam line and naphtha line header by 100 mm to match the same with new orientation of the burner.

The second option was preferred over the first and accordingly job was carried out.

INSTALLATION OF BURNER :

After completion of Arch plate cutting, shifting of support frames and steam and Naphtha header, burner installation were carried out as follows :

Burner at Sr.No.101 was installed for getting the exact requirements of fittings due to reorientation. Finally proper extra fittings were procured from M/s.Mcwell fittings and M/s.Vijay Electrical Kalol and the required suitable lines were prefabricated.

NAPHTHA LINE :

In Naphtha line one ball valve was provided in place of two needle valves which was prefabricated in the yard. Only field weld was done at site by Tig welding (used filler wire ER-308). In order to reorient the burner, two nos of 2" x 4" long & 6" long NPT Nipple with two 90 deg. thd. elbows were required to add up for each burner.

PURGING LINE :

In the purging steam line, it was planned to change gate valve by ball valve but due to shortage of material only 35 Nos of gate valves could be changed.

A.G.LINE :

Existing A.G.line is 1" NB (25 NB). New burner have 1 1/2" inlet line, the same was hooked up to the new burner through a reducer.

JOB CODE                      JOB DISCRIPTION

50

PILOT GAS LINE :

These lines were removed as the same had become redundant because of the modifications.

SCAFFOLDING ARRANGEMENT :

It was decided to put scaffolding row vice, starting from first row with the new scaffolding pipes which were procured for this purpose. But it was found that it takes more time so it was decided to make scaffolding by big pipe (12 mt length) hired by TCI which covered three rows simultaneously. It was decided to keep 2 mt. height below insulation for good working height. Grating was put on top of scaffolding.

INSTALLATION OF BURNER BLOCK :

Ceramic blocks were lifted from bottom of radiant section through an arrangement which was made for this purpose. At a time one burner block was lifted upto burner level and tightened all four bolts. During installation of burner blocks Arch roof insulation were removed adequately to accomodate burners.

LEAK TEST :

After all pipe connections were ready ; leak test was done with soap solution. For this purpose hose connection was given and each header of Naptha/ steam lines and instrument air was charged at 5 Kg/cm<sup>2</sup> in each header.

NOTE :

During this test, unions were found heavily leaking due to misalignment of seating areas. So it was decided to put linseed oil on the seating area of union. This experiment was effective and all the leakages were attended by this method only.

DP TEST :

All weld joints were checked by D.P.test and repair work was done wherever required.

JOB CODE

JOB DISCRIPTION

51

OTHER JOBS CARRIED OUT IN PRIMARY REFORMER :

- (1) During all previous Turnarounds , the access to Primary Reformer was normally made from the two 20" x 20" size explosion windows provided on the furnace. Because of the small size of these windows, lot of problems were faced during entering scaffolding material etc. in to the furnace. Hence it was decided to create a new manhole opening of 1.5 Mtrs. x 1.5 Mtrs.size in the East side wall of the Radiant section so that the same can be used as a passage for entering inside the furnace and also for ease of transfer of scaffolding material and other maintenance items into the furnace from outside and vice versa.

The bolted manhole was made during this turnaround for the above purpose which was installed with internal insulation of Ceramic fibre blanket.

- (2) The tunnel slabs were replaced by new ones wherever old ones were found broken.
- (3) Insulation of bottom header was checked and repaired wherever required.
- (4) Refractory repair in Convection zone and Radiant zone were carried out. Major repair was done in the transition section of primary reformer where complete castable refractory of the roof was replaced.

After leak test and D.P.test were over, the burners were ready for reformer light up on 01/06/97. Finally primary reformer was lighted up on 07/06/97 at 04.00 PM.

01 13 01 HEAT EXCHANGERS AND COOLERS HYDROJET  
CLEANING,RETUBBING ETC :

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

JOB CODE

JOB DISCRIPTION

52

Sr. No.	Equipment	QTY. Nos.	NO. of Tubes	Retu- bing	Tube side Kg/cm2		Shell side Kg/cm2		Hydrojet ting  Cleaning
					Design Prss.	Hydro tested	Design Prss.	Hydro tested	
1	104-C	01	1275	-	34.1	-	30.6	46	Tube & shell s
2	108 CA/CB	03	1415	-	05.27	8.0	05.27	-	-- Do
3	108-CIB	01	1415	Tube bundle was replaced with new one.	05.27	8.0	05.27	-	-- Do
4	109-CA/CB	04	1150	-	30.58	46.0	05.27	8.0	-- DO
5	116-C	01	300 "U" Tube	-	73.1	-	10.5	16.0	-- DO
6	115-C	01	649 "U" Tube	-	29.9	-	10.6	15.8	-- DO
7	124-C	01	775 "U" Tubes	-	158	-	17.6	24.0	-- DO
8	131-J	01	690	22	17.58	-	05.25	08.5	-- DO

(ii) Following heat exchanger and coolers were opened and boxed up after hydrojetting from tube side. Exchangers were also hydrottested after assembly.

JOB CODE                      JOB DISCRIPTION

53

Sr. No.	Equipment	Qty. Nos.	No. of Tubes	Return- ing	Tube side		Shell side		Hydrojet- ing
					Design Prss.	Hydro tested	Design Prss.	Hydro tested	
1	105-CA	1	2790	181	5.27	-	30.9	42.0	Tube side
2	105-CB	1	2790	81 (1 No Plugged)	5.27	-	30.9	42.0	-- DO --
3	110-CA/CB	2	763	-	5.6	-	05.27	08.0	-- DO --
4	111-CA	1	2790	-	5.27	-	05.27	08.5	-- DO --
5	111-CB	1	2790	2 (2 No Plugged)	5.27	-	05.27	08.5	-- DO --
6	114-C	1	770	-	29.9	46.0	05.27	08.0	-- DO --
7	127-CA	1	3100	(1 No Plugged)	5.6	-	21.1	32.0	-- DO --
8	127-CB	1	3516	-	5.6	-	21.1	32.0	-- DO --
9	173-C	1	294	-	10.6	-	5.3	8.0	-- DO --
10	175-C	1	222	-	3.2	-	-	2.2	-- DO --

(iii) Following lube oil coolers were opened, cleaned by rod-pocking and boxed up.

- 1) 101-JLC / 1,2 & 3 Lube oil cooler ( 3 Nos)
- 2) 102-JLC / 1 & 2 Lube oil cooler ( 2 Nos)
- 3) 103-JLC / 1 & 2 Lube oil cooler ( 2 Nos)
- 4) 104-J Lube oil cooler ( 5 Nos)
- 5) 105-J Lube oil cooler ( 2 Nos)
- 6) 101-BJ Lube oil cooler (3 Nos)

(iv) Following gland condensers were opened & cleaned by rod pocking and boxed up.

- 1) 101-J Gland condenser
- 2) 101-JCA Surface condenser
- 3) 105-J Gland condenser
- 4) 103-J Gland condenser

JOB CODE

JOB DISCRIPTION

54

01 16 01 STRAINERS AND FILTERS JOBS :

- 01) Air compressor suction filter side (inside cabin) cleaned properly.
- 02) Syn.Gas compressor L.O.filter elements changed with new one - 84 Nos.  
Six way valve was also changed with new one.
- 03) C.W.line inlet strainer for 104-J , 104-JA , 107-J, 107-JA and 101-BJ turbine cleaned.
- 04) 112-J, 112-JA and JB suction strainers cleaned.

01 17 01 VALVES REPAIR / REPLACEMENT JOBS :

- 01) SP-39 D/S flange gasket changed with new one 18"-300 #.
- 02) SP-5 MOV changed with new one and removed flange tension by cutting and rewelding.
- 03) SP-71 MOV was repaired by M/s.DANDI Valve & Co. and replaced.
- 04) 101-F south side LG Both isolation valves top and bottom changed 1" x 1500 # S.W.Gate valve.
- 05) 156-F R.V.checked found OK.
- 06) 2004-JT 38 kg steam inlet valve on rack gland packing changed.
- 07) 38 Kg/cm<sup>2</sup> steam to HTS bottom isolation valve gland leak attended in last shutdown. Its rack valve gland packing changed.
- 08) V-151 U/S block valve gland packing changed.
- 09) 102-J L.O.turbine sentinal RV attended.
- 10) 101-J / 105-J MOP Discharge RV attended.
- 11) 101-JT TTV overhauled by M/s.Gangotri Engg.
- 12) 101-JT steam inlet line drain valve gland packing changed.
- 13) 103-JBT TTV overhauling done.
- 14) 103-JAT TTV overhauling done. 3 Nos bearings changed.
- 15) V-25 Block valve and its plug valve checked found D.K. Globe valve gland leak rectified in last shutdown. no leak.

JOB CODE                      JOB DISCRIPTION

55

- 16) LC-13 control valve U/S and D/S plug valves gland filled with AUDCO grease for the required service.
- 17) 105-D inlet line at MIC's common line drain valve changed with new one 3/4" x 1500 # S.W.gate valve.
- 18) Rupture Disc RV (SP-35) changed with new one.
- 19) 101-F south side LG 3rd port (west side) gauge glass set changed with new one.
- 20) 101-F local 1st isolation valve gland packing changed.
- 22) M.S.header steam to Air coil flow transmitter HP tapping main isolation valve changed with new one 1" x 1500 #.
- 23) 102-JT S.O.Turbine inlet line PI isolation valve gland packing changed.
- 24) 38 Kg drain line trap near blow down drum upstream isolation valve gland packing changed.
- 25) Snuffing steam to SP-5 1st isolation valve gland packing changed.
- 26) 101-BJT drain and TTV drain valve 3 Nos gland packing changed.
- 27) 103-JAT Steam outlet line block valve D/S drain valve gland packing changed.
- 28) 104-JAT TTV drain valve (U/S) gland packing changed.
- 29) M.S.Steam to HTS isolation valve gland packing changed.
- 30) 101-J / 105-J L.O.Turbine steam inlet block valve up stream drain valve changed with new one.
- 31) 101-J / 105-J L.O.turbine TTV U/S drain valve changed 3/4 " x 800 #.
- 32) MIC-61 U/S drain valve gland packing changed.
- 33) 105-JT steam inlet PI tapping isolation valve U/S TTV gland packing changed.
- 34) 181-C steam inlet PI isolation valve gland packing changed.
- 35) FRC-2 Transmitter L.P. and H.P.tapping 1st valve gland packing changed.
- 36) FRC-12 Transmitter tapping root valve gland packing changed.

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- 37) 105-JT steam inlet line drain valve gland packing changed.
- 38) 102-JT gland condensor power steam line U/S drain valve changed 1" - 800 #.
- 39) 181-C Steam inlet control valve U/S and D/S drain valve gland packing changed.
- 40) PICV-14 Bypass valve and U/S isolation valve gland packing changed.
- 41) FRC-25 impulse line root valve changed 3" - 800 #.
- 42) 107-JT/JAT isolation valve on rack gland packing changed.
- 43) 101-J / 105-J L.O.Turbine steam inlet U/S 1st P.I. drain 2nd isolation valve gland packing changed.
- 44) 101-JT TTV drain valve gland packing changed.
- 45) 105-JT steam inlet PI tapping valve gland packing changed.
- 46) 103-JAT exhaust line drain valve and its steam trap changed 1/2" - 800 # gate valve.
- 47) 112-JT steam inlet line trap isolation valve (1st) gland packing changed.
- 48) 102-J S.O.turbine steam inlet 1st block valve gland packing changed.
- 49) 102-J S.O.turbine exhaust line 2nd block valve gland packing changed.
- 50) 102-J S.O.Turbine PI isolation valve gland packing changed.
- 51) Steam to Air coil transmitter main isolation valve changed 1/2" - 800 # S.W,gate valve.
- 52) V-5 U/S Block valve Bypass valve gland packing changed.
- 53) 101-JT steam inlet line drain 1st valve gland and trap isolation valve gland packing changed.
- 54) PI-81 tapping isolation valve 1st and 2nd gland packing changed.
- 55) Aux.Boiler burner No.1 and 2 purging steam valve gland packing changed.

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- 56) Utility BFW coil outlet line PI Drain valve Bonnet leak was attended.
- 57) 11 Kg/cm<sup>2</sup> steam to D/S steam line drain valve gland follower rectified.
- 58) 3.5 Kg/cm<sup>2</sup> steam to 111-CA PI isolation valve changed 3/4" - 800 # S.W.gate valve.
- 59) Atomising steam for header 7 & 8 drain valve changed.
- 60) 112-JT steam exhaust valve gland packing changed.
- 61) 102-JT L.J.turbine exhaust line PI isolation valve gland packing changed.
- 62) FI-49 (113-C) HP tapping root valve gland packing changed.
- 63) L.S. to 113-C rack valve gland leak rectified.
- 64) 101-JT steam inlet valve and U/S 1st drain valve gland packing changed.
- 65) 38 Kg/cm<sup>2</sup> steam header drain valve near 119-F gland packing changed.
- 66) 3.5 Kg/cm<sup>2</sup> steam to 102-JT line NRV D/S flange gasket changed.
- 67) 103-J L.O.cooler (Bottom) isolation valve made operable.
- 68) 101-JCV outlet valve made easy operable.
- 69) 129-JC C.W.outlet line vent valve changed 1/2" - 150 # (Brass threaded valve)
- 70) 38 Kg/cm<sup>2</sup> steam to HTS bottom isolation valve gland leak attended.
- 71) Air compressor turbine (101-JT) TTV overhauled.
- 72) 104-JT steam inlet line drain valve gland packing changed.
- 73) Refrigeration compressor turbine TTV checked found OK.
- 74) 103-JAT TTV overhauling done. Changed 3 Nos bearings.
- 75) 110-CA/CB CW vent to be extended up to ground level
- 76) 104-E RV tested for passing.

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- 77) 104-J BFW pump discharge valve repairing done by M/s.Dandy Valve.
- 78) 103-JAT exhaust valve changed.
- 79) SP-71 HTS inlet vent valve passing attended by Dandi Engg.
- 80) 108-J / JA suction line drain valve changed with new one 4" - 150 # flanged type.
- 81) FRC-2 block valve passing attended by Dandi Engg.
- 82) Steam drum (101-F) south side LG both isolation valve 1" - 1500 # gate valve S.W. (2 Nos) changed with new ones.
- 83) Auxilliary coil all blow down valves passing was attended by M/s.Dandi Engg.
- 84) 112-F drain line 2nd isolation valve.
- 85) 119-C drain valve changed 1" - 800 # threaded.
- 86) 119-C NH3 drain line isolation valve changed 3" - 800 # S.W.gate valve.
- 87) 111-F drain valve changed 2" - 800 # S.W.gate valve.
- 88) 111-F drain valve 3/4" - 800 # changed S.W.gate valve.
- 89) 117-C Ammonia draining line valve changed 3/4" x 800 # S.W.gate valve.

JOB CODE

JOB DISCRIPTION

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01 18 01 STEAM TRAPS AND GAS TRAPS:

Following steam traps / gas traps.were changed with new one of SPIRAX Make and TD-3 type.

Sr. Location	End connection
No.	-----

STEAM TRAPS :

1	2004 JAT Exhaust(LP Steam)	Threaded Type
2	2004 JAT Inlet (MP Steam)	do
3	104 J Steam Inlet(MP Steam)	do
4	Near MIC-61(MP Steam)	do
5	Near PRC-2(LP Steam)	do
6	Near PRC-2(MP Steam)	do
7	Near 174-C(LP Steam)	do
8	ID FAN.Turbine Exhaust(LP Steam)	do
9	Near PRC-5,HTS(MPS Steam)	do
10	Near PRC-5,HTS(MP Steam)	do
11	Refomer Penthouse Row No.1(LP Steam)	do
12	Do # 2	do
13	Do # 3	do
14	Do # 4	do
15	Do # 5	do
16	Do # 6	do
17	Do # 7	do
18	Do # 8	do
19	Do # 9	do
20	Near 101 CA/CB(LP Steam)	do
21	Near 119-F(MP Steam)	SW Type
22	Near 119-F(MPS Steam)	do
23	Near 119-F(LP Steam)	do
24	Near 114-F(LP Steam)	Threaded Type
25	Near 114-F(LP Steam)	do
26	Near 120-C.South Side(LP Steam)	do
27	103 JLO,Turbine Exhaust(LP Steam)	SW Type
28	103 JBT Exhaust(LP Steam)	Threaded Type
29	105 JT Inlet(MP Steam)	do
30	101 JT Inlet(MP Steam)	do
31	101/105 JLO.Exhaust(LP Steam)	do
32	PIC-14,D/S(MP Steam)	SW Type
33	PIC-14,U/S(MPS Steam)	Threaded Type
34	PIC-17,D/S(LP Steam)	do
35	PIC-17,U/S(MPS Steam)	do

Total Nos.of Traps Replaced = 35 Nos.

GAS TRAPS

1	On PRC-1,Vent Silencer	Flanged Type
2	On PRC-1A,Vent Silencer	do
3	On PRC-4,Vent Silencer	do
4	On PRC-72,Vent Silencer	do

Total Nos.of Traps Replaced = 04 Nos.

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01 19 01 CO2 ABSORBER(101-E) INSIDE REPAIR:

CO2 Absorber (101-E) was opened for inspection during this annual turnaround. Following were observed after inspection of the internals.

- The inside surface of shell was found to be free from corrosion in top ten trays / compartments.
- Below the tenth tray corrosion / erosion was observed on shell surface which was about 1 to 3 MM deep. Similar corrosion was also observed below tray nos 17 to 19.
- The channeling due to corrosion of approx. 6 mm deep was observed on east side between 19th and 20th tray at different locations.
- Near the north - west side support of fifteenth tray shell surface area of approx. 1 Sq.inch was found corroded near the support welding by approximately 5 mm deep.
- The north - west side support of 17th tray was found corroded badly.

It was decided to apply belzona cold welding compound in severely corroded areas between 17th to 19th trays. M/s.AVEE Enterprise, Ahmedabad was contacted to do this repair work with Belzona compounds. Similar repair jobs were already carried out with Devcon cold weld compound during 1993 Annual turnaround in selected areas in bottom portion. The same were found to be in good condition for this repair work at present. The quantity which was consumed was as below.

1. Ceramic R Metal (1311) (Pkg.size 2 Kg) : 12 Kg
2. Ceramic S.Metal (1321) (Pkg.size 01 Kg): 08 Kg
3. N.F.Cleaner/Degreaser(Pkg.size 0.5 ltr.):05 ltrs.

01 23 01 CHANGING SOLUTION FOR CO2 REMOVAL SYSTEM :

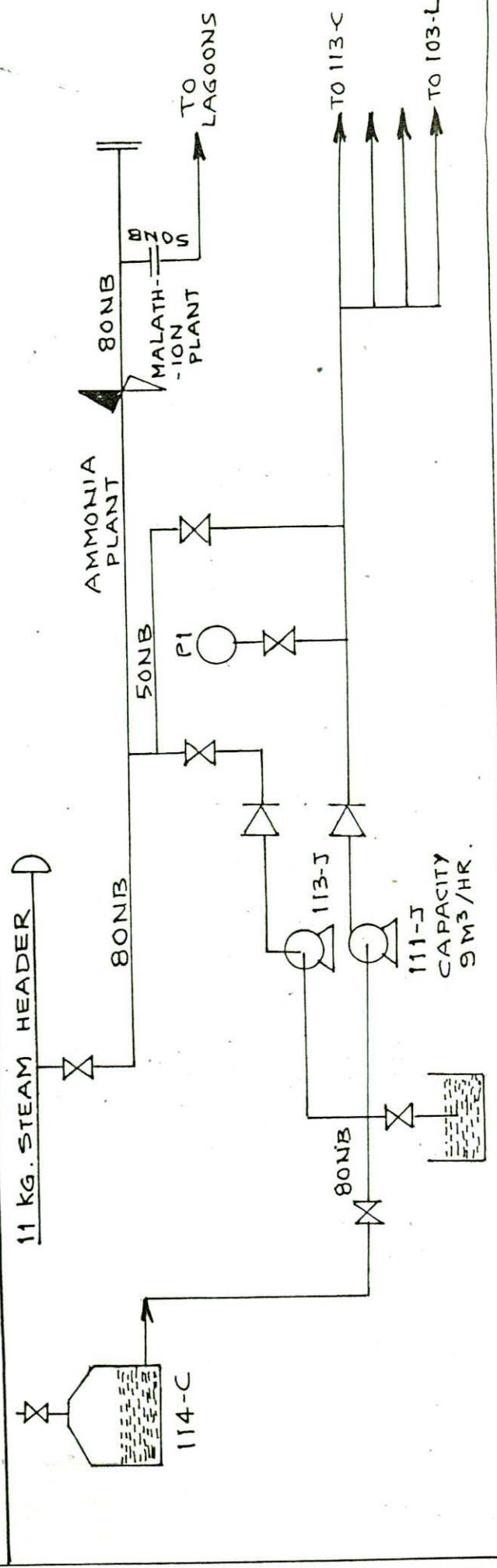
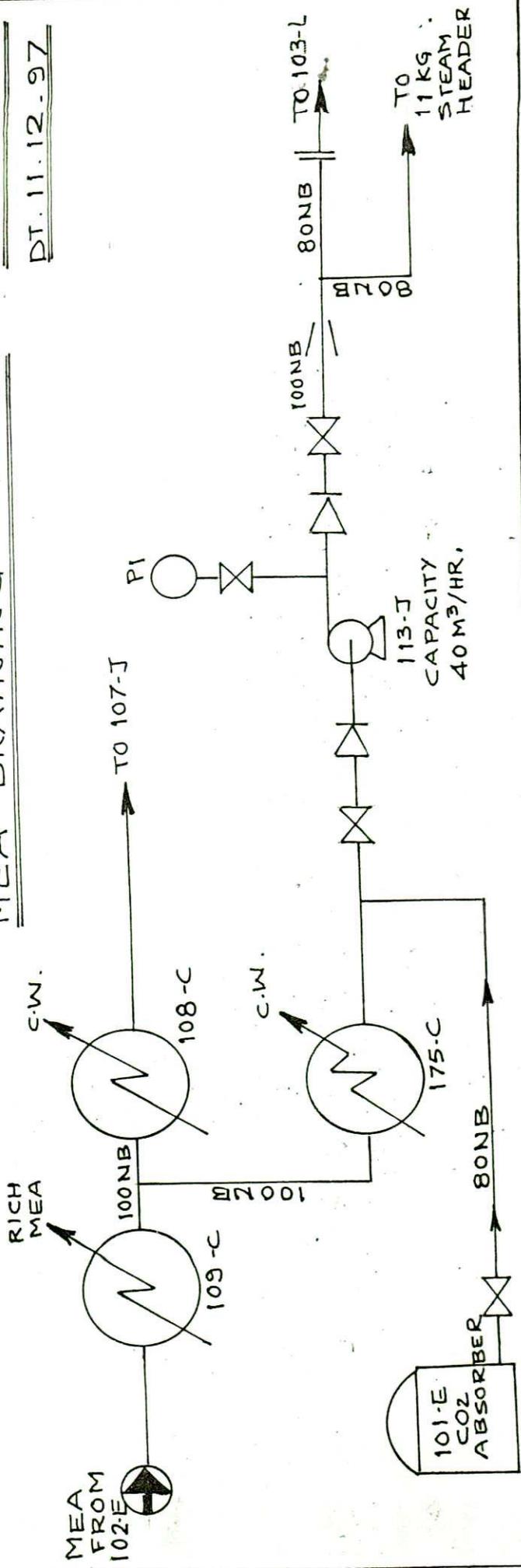
To prevent corrosion in CO2 removal system and to improve the energy consumption, the MEA solution of CO2 removal system was replaced with MDEA solution. The energy consumption per Kg. mole of CO2 removal come down after swaping of soluton to 10,000 Kcal from 48,000 Kcals.

The MEA solution in the system was to be drained for charging new MDEA solution. It was decided to drain the MEA solution in the system through 11 ata steam header. For this purpose an arrangement was made which is shown in schematic diagram. (See Figure-1)

# MEA DRAINING SYSTEM

FIGURE: 1

DT. 11.12.97



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All the exchangers in the CO2 system were opened for thorough cleaning from tube side and shell side.

After draining, flushing and chemical cleaning of the system, fresh MDEA solution (Total 600 drums) was charged into the system through 113-J pump.

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AMMONIA PLANT  
INSPECTION JOBS

JOB CODE	JOB DESCRIPTION
01 41 01	<p><u>PRIMARY REFORMER JOBS :</u></p> <p>During this shutdown all the arch burners were replaced.</p> <p><u>(a) RADIANT ZONE :</u></p> <p>i) Visual inspection of refractory, tubes and insulation was carried out and following observations were made. In general, the overall condition of the refractory and the catalyst tubes, risers and the bottom collectors was satisfactory. Total 17 nos. Tunnel Slabs were found damaged.</p> <p>East wall refractory bricks segment near south wall were found projected inwards causing gap between the metallic wall and bricks. Some erosion of the brick wall on north side at tunnel slab elevation was noticed near tube row no.2 and 3. The insulation of bottom header has got minor damage only i.e. unfolding of outer layer of insulation blanket etc. except on the 1st row, below 1st tube weldolet and header insulation, which was exposed. The roof insulation pyroblocks were also partially damaged at different locations however, no where roof plate was found exposed due to the damage of roof insulation. The copy of this report was given to Shift Incharge (Amm) and Maint Engrs on completion of inspection.</p> <p>ii) Automatic ultrasonic scanning of all the 336 nos. catalyst tubes and 8 riser tubes was carried out by M/S. PDIL. Necessary arrangements for undertaking the automatic scanning were made before arrival of the PDIL teams. PDIL teams started the work on 22-5-97 and completed scanning on 30-5-97. The scanning revealed that all the tubes including the risers were in good condition and were predicted to give uninterrupted service for 10,000 hours provided all operating parameters are maintained as per the design limits. The preliminary site report submitted by M/S. PDIL is enclosed herewith at <u>Annex 1</u>. The final report of scanning received from M/S. PDIL indicated that in general all the catalyst tubes and riser tubes have some defect free areas and presence of micor fissures and micro voids (Grade-B), which is normal except tube no. 129, which has been evaluated as Grade-C tube i.e. more deteriorated tube having voids, micro-fissures and macro fissures are contained in it. However, as per PDIL, this is not a matter of immediate concern as regard to its life and overall condition.</p> <p>iii) Creep measurement of outlet manifold was carried out at four locations i.e. on either side of the field welds. Maximum diameter observed was 142.3 mm against manufacturing tolerance Min. 141.3 to 142.1 mm (Max). With reference to permissible max. dia of header, the creep is 0.14% which is well within safe limits. The detailed readings were recorded for each row and are attached herewith at <u>Annex. 2</u>.</p> <p>iv) Clearance between the furnace floor and the outlet manifold was measured at six different locations on each manifold. The insulation was removed at these locations and the distance was taken with bare header. The clearance readings are attached herewith at <u>Annex 3</u>. In general, the clearance was adequate.</p>

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JOB CODE	JOB DESCRIPTION
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v) DP test was carried out for the following weld joints of the harp assemblies:

- a) All the header butt welds, 16 nos. (2 joints on each header)
- b) Randomly selected four nos. catalyst tubes 'D' welds in each row.
- c) Catalyst tube to weldolet and weldolet to outlet header weld joints for two nos. catalyst tubes selected in each row.
- d) Riser tube to weldolet and weldolet to header joints for all the eight risers.

No defects were revealed during DP test carried out on all the joints mentioned above.

vi) Spring hanger readings were taken in cold condition for all the spring hangers bottom drain position readings were also taken. The spring hanger of catalyst tube no 142 was found defective. This was replaced with the spare spring hanger. Before using the spring hanger, it was checked for spring load calibration and was found satisfactory.

vii) Ultrasonic flaw detection of dissimilar metal weld (catalyst tube to T-11) of catalyst tube nos 839 to 842 was carried out to assess the development of any service cracks in this joint. No defects were recorded in the weld joints scanned.

Report is attached herewith at Annex-4.

(b) HT CONVECTION ZONE:

1) Visual inspection of the HT convection zone coils and refractory etc. was carried out. The following observations were made during the examination. These were communicated to Shift Incharge (Amm) and Maint. Engrs. on completion of inspection.

i) On the west wall, insulation covering metallic sheet had got damaged in approx. one square meter area near bottom causing direct exposure of ceramic fiber blankets to flue gases.

ii) The Mixed feed coil located at the bottom of HT zone was found to have its tubes covered with brownish coloured powder coating which was required to be removed by proper cleaning method to improve heat transfer.

iii) Thermowells in front of tunnel row nos 1, 3, 4, 7 and 8 had got bent and also were found to have thick scales on OD.

iv) In the transient zone between tunnels and HT convection bottom, the roof castable had got partially damaged at different locations particularly more in front of tunnel nos. 3, 8 and 9.

2) Ultrasonic thickness measurement on all the coil tubes bends located at the east side panel was carried out. The readings are enclosed herewith at Annex 5.

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3) Insitu metallography of two nos. spots randomly selected in HT steam superheater coil tubes near east side bend to tube weld and on straight tube was carried out. The structure observed during the examination was reported to have sound microstructural condition by the metallurgist of M/S PDIL. The preliminary report submitted by M/S. PDIL is enclosed herewith at Annex. 6.

(c) LT CONVECTION ZONE:

1. Visual inspection of the coils, refractory walls, ID fan suction ports, impeller etc. was carried out. The following observations were made and immediately communicated to Shift Incharge (Ammonia Control Room) and Maintenance Engineers.

i) Debris of refractory were lying in the suction ports of east and west sides of ID fan.

ii) The west end of the soot blowing pipe in the east side suction port of ID Fan appeared to have got loosened and hence the refractory castable around the end of this pipe was damaged causing exposure of metallic plate to flue gases.

iii) The top most plug in the east side suction duct of ID fan was missing.

iv) One number small pinhole appx. 1mm dia was observed on the partition wall of the east side suction duct of ID fan.

v) On the west wall, at the south side at the elevation of offsites BFW coil and new BFW coil, the refractory castable had got damaged causing exposure of metallic wall plate.

vi) Between second and third intermediate supports, brownish coloured bends with white stripes were observed on the end tubes of new BFW coil.

vii) Offsite BFW coil bottom most two tubes at the south end were found with their fins covered with refractory and soot on the bottom half circumference. Also, refractory and other debris were seen on the tubes of offsite and new BFW coils. It was suggested to clean the fins.

2) Ultrasonic thickness measurement of the coil bends was carried out on east side end after removal of the panels on the east side. For ammonia BFW coil, the header box cover was also opened on west side and thickness measurement was carried out on the tubes. The detailed report on thickness measurement is enclosed herewith at Annex.7.

3) Insitu metallography on two numbers tubes of LT steam superheater coil located on LT zone top was carried out by PDIL experts. The microstructure was found to be sound and no abnormalities were reported in the preliminary site report submitted by PDIL metallography team. (Please refer Annex.6.)

JOB CODE	JOB DESCRIPTION
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(d) HT-LT TOP :

(1) Visual inspection was carried out. The following observations were made:-

(i) The LT Steam superheater coil supports have got badly burnt in the tubes. The coil has also got inclined due to weakening of supports and structure.

(ii) Coil fins have also been observed to be damaged on some tubes.

(iii) Some inclination was also observed on Ammonia BFW Coil.

(iv) The overall condition of the wall insulation was good.

In view of the deteriorated supports and weakened structure, it is recommended to replace the LT Steam Superheater coil including its supports at the earliest to avoid catastrophic failure which may affect the other coils located below this coil in the LT convection zone.

(e) AUXILIARY BOILER FURNACE :

(1) Visual inspection of the refractory and coils/tubes was carried out.

The following were the observations which were communicated to Shift Incharge (Amm), Civil Engineers and Amm. Maint.

(a) At the south end of the west wall, at about 15 feet height from bottom, the insulating bricks had come out from its position.

(b) The castles covering the header on north wall coil bottom had got badly damaged causing exposure of 75% length of header. This was recommended to be repaired.

(c) Deposition of scales on burner fans needed to be removed from all the five burners.

(2) Ultrasonic thickness measurement was carried out on tubes. Thickness measurement report is attached herewith at Annex 8.

(3) Metallography on randomly selected two nos. tubes at two spots was carried out by metallography team of PDIL. Microstructure was observed to be sound. (Pl. see Annex.6)

(f) TRANSFER LINE.107-D :

Visual inspection of the transfer line internals was carried out. The following observations were made :-

(a) The reinforcement pad provided on the transition cone inner pipe of 8th and 7th riser was found to have bulging on its ID and made an opening of 10mm wide on half of the circumference at the west side. This caused exposure of refractory material below the liner plate at this location. Also the liner plate surrounding the reinforcement pad was found to have some corrugation on the surface.

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(b) Between 8th and 7th riser, the liner plate segment got bulged at one location with 4 to 5 mm size bulging towards ID, on 25mm width all around the circumference.

(c) Similarly on 6th, 5th, 4th and 3rd riser, the reinforcement pad surrounding the transition cone inner pipe was found to have bulging on its ID and made an opening of approx. 25mm wide all around the circumference.

(d) 2nd and 1st riser transition cone inner pipe reinforcement pads were found to have severe bulging all around the circumference on its ID and caused an opening of 2" wide approx. and also reinforcement pad lifted up from its ID. Due to this, castable refractory had got exposed at this opening. (see fig. attached at Annex.9)

(e) The remaining length of the line segment up to Secondary Reformer Inlet was found to be in good condition with minor bulging/corrugations on liner.

(f) The 3rd liner segment from secondary reformer side (Between radiant section and secondary reformer zone) is made out of four pieces and welded longitudinally between each quadrant segment. Out of the four long welds, one joint was found to have welding on 4" length only and the remaining length of the joint has not been welded. Bulging of liner plate was observed longitudinally at this location where welding was not done between liner segments.

All the above findings were reported to concerned Maint./Production Incharge.

01 41 02

VESSELS / TANKS :-(1) SECONDARY REFORMER, 103-D:TOP SHELL :

After removal of catalyst and Alumina balls, Secondary reformer was offered for inspection. The following observations were made during inspection :-

(a) The top dished dome and shell refractory up to 1.5 metre height from top was whitish in colouration. Below this, approx. one metre shell length had got reddish colouration. Remaining portion of the refractory was greyish in colour.

(b) Superficial cracks were noticed on the refractory surface.

(c) Holes of some of the dome bricks for passage of gas were found choked. These were required to be cleaned after removal of leftout alumina balls.

(d) Some erosion patches on the refractory lining having approx. 4 Sq. inch area at scattered locations on North and North East wall were observed. Maximum depth was about 10mm at two locations and one to three mm depth of erosion was found at other locations.

(e) The weld joint of metallic liner segment was found with fine crack in approx. 2 feet circumference on East side and South side. The liner had also got buckled inward at the weld location.

Note: The liner welds were repaired by workshop/Maint. team by grinding and welding followed by DP test. The bulged area of the liner was also rectified to ensure proper installation of mixed burner assembly

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JOB CODE	JOB DESCRIPTION
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BOTTOM DOME :

After removing the bottom plug, visual inspection of the secondary reformer bottom area was carried out. The following observations were made.

DOMES BRICKS REFRACTORY :-

(i) Some erosion of bricks was noticed on the south side between 2nd and 3rd circle from centre.

(ii) One brick of sixth circle from centre had got slight erosion on East side.

(iii) Minor erosion on the brick surface of the third circle on east side was also seen. Necessary patch work to cover the eroded areas of the bricks was recommended. Also, the holes between the bricks were found choked which needed to be cleaned before final boxing up.

(iv) The skirt liner sleeve had got buckled on 50% circumferential length towards North side causing an opening of 6" to 7" between the shell refractory and skirt.

101-CA INLET NOZZLE :

(i) Liner stub end was found buckled/deformed and a crack was observed on 12" circumference on top location.

(ii) The second liner segment from stub end had got shifted towards distributor side by approx. 5" from the sliding joint from its original position which caused an opening of approx. 5" between the second liner segment and backing strip. The refractory had got exposed at this location.

(iii) The remaining portion of the liner had got slightly bulged/buckled at different locations.

(iv) The gas distributor was found intact in position.

101-CB INLET NOZZLE :

(i) Minor buckling of the stub end flange was observed.

(ii) The liner segment at the distributor end had got buckled by approx. 3" in approx. 7" circumference on North side.

(iii) The gas distributor pipe had got fractured along the length at two locations 180 deg. apart. Bottom half of the distributor pipe was found buckled causing an opening of 5" to 6" width at the cracked length of the distributor. Some refractory debris were found lying inside the distributor.

All the findings were informed to concerned plant engineers.

01 41 03

LTS and HTS Vessels, 104-D :

(a) Visual inspection of LTS and HTS vessels was carried out after removal of catalyst. Bottom dished ends of both the vessels could not be inspected as Alumina balls were not removed. The following observations were made :-

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LTS Vessel :

- (i) In general, the vessel had assumed greyish black colouration.
- (ii) The weld joints and shell parent metal are in good condition and do not exhibit any sign of corrosion.
- (iii) The wiremesh on the alumina balls and annular strip holding the wiremesh were intact in position.
- (iv) The dumpout nozzle and its weld joints were in good condition.
- (v) The thermowell pipe had got slightly bent and it was extending into alumina balls at the bottom dished end.

(b) Ultrasonic thickness measurement on top dished end and shell was carried out. Thickness was found to be normal. Report is enclosed herewith Annex. 10.

(c) Ultrasonic flaw detection of all the 'T' joints was carried out. No indication of service defect was revealed.

(d) Magnetic particle testing of all the weld joints except the bottom circumferential seam (Bottom dished end to shell) was carried out. No defects found.

(e) The bottom circumferential seam was DP tested. No defects were observed.

(f) Hardness measurement was carried out on parent metal, on weld joint and on Heat Affected Zone of the parent metal. The following results were obtained:  
----- Longitudinal Weld Seam between top dome and first course:--

Weld	---	154 BHN
HAZ	---	148 BHN
Parent Metal	---	144 BHN

----- Circumferential Weld Seam between first and second course:--

Weld	---	162 BHN
HAZ	---	142 BHN
Parent Metal	---	148 BHN

HTS Vessel :

(a) Visual inspection of vessel internals was carried out. The following observations:--

- (i) In general the shell had assumed greyish black colouration.
- (ii) All the weld joints and shell plates were found free from corrosion.
- (iii) The nozzle welds were also in good condition.

(b) Ultrasonic thickness measurement on top dished end and shell was carried out. Thickness was found to be normal. Report is enclosed herewith Annex 11.

JOB CODE      JOB DESCRIPTION

(c) Ultrasonic flaw detection of all the 'T' joints was carried out. No indication of service defect was revealed.

(d) Magnetic particle testing of all the weld joint except the bottom circumferential seam (Bottom dished end to shell) was carried out. No defects found.

(e) The bottom circumferential seam was DP tested. No defects were observed.

(f) In situ metallography was carried out at three locations on the shell and at one location on the weld joint. Replicas were taken for the metallography of the parent metal. For the weld metal, replica was not taken by the PDIL team. The locations of the points where metallography was performed are given below:

Point No. 1: On South West side, 30 CM towards West from the Bottom course Long. Seam edge and appx. 73 CM above C1 (shell to bottom dished end Circumferential seam).

Point No. 2: On East side, appx. 70 CM above C1.

Point No. 3: On North West side, Appx. 1 Metre above C1.

Point No. 4: On weld joint L1 ( Long. Seam of the bottom course), appx. 70 CM above C1.

At point no. 1, comparatively more deterioration as compared to the other points examined was reported by PDIL team. They recommended to carry out a microstructure study during next shutdown. The details of their findings are given at Annex.6 which may please be referred.

(g) Hardness measurement on parent metal, HAZ and weld joints was done. Min. Hardness was found to be 165 BHN and Max. Hardness was 200 BHN. After metallographic examination, hardness measurement was again carried out on the polished area of the weld joint and parent metal.

The followings are the readings.

---- On Longitudinal weld seam of the bottom course (South Side):- 194 BHN

---- On shell parent metal at south side:- 163 BHN

---- On shell parent metal at East side:- 178 BHN  
(Appx. 70 cm above C-1)

---- On shell parent metal at North West side, appx. 1 meter above C-1:- 178 BHN

The above measurements were carried out using telebrineller hardness tester.

JOB CODE	JOB DESCRIPTION
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01 41 04	<u>[01] CO2 ABSORBER,101-E :</u>
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Visual inspection of the CO2 Absorber was carried out after removal of single tray segments on each tray. The following observations were made:-

(1) In general, the shell had assumed blackish colouration.

(2) The condition of demister pad was found satisfactory. The north side distribution header had got loosened.

(3) The shell surface was free from corrosion in top ten tray compartments. After tenth tray, some roughening has been observed on shell surface which was found to be increasing from fourteenth tray onwards. Approx. 1 to 3 mm corrosion had been observed in tray compartments no. 14 to 19. These areas were marked. The corrosion channeling of approx. 6mm deep was observed on east side surface of the shell surface between 19th and 20th tray at different location. Near the North -West side support of fifteenth tray, one square inch shell surface was found corroded near the support welding by approx. 5mm depth.

(4) The North West side support of 17th tray had got corroded badly.

(5) The overall condition of the ceramic compound applied on the previously welded areas of shell was quite satisfactory.

(6) Due to surface unevenness and roughening, thickness on the corrosion affected areas could not be measured. Ultrasonic thickness measurement of shell surface was carried out in remaining areas. Min. thickness was recorded as 47.4mm against design thickness of 46.04mm (above 20th tray) and 46.8mm (below 20th tray). The detailed report on thickness measurement is enclosed herewith at Annex. 12.

It was recommended to provide corrosion/erosion resistant compound on the corrosion affected areas particularly below fourteenth tray.

[02] CO2 STRIPPERS, 102 EA/EB :

(a) 102-EA :-

Visual inspection, inspection of distribution header modification work and ultrasonic thickness measurement of the shell was carried out.

(1) The following observations were made during visual examination:-

(i) The distributor header support (old-existing) located at North-East corner was found to have got deformed and its welding with shell was found cracked. Similarly, the supports located at the South-East and North-West corners were found cracked at their ribs welding with the shell. Since, the supports were not included for replacement in the contract job of distributor replacement, it was suggested to carry out repairs on the defective welds and supports. All the repaired welds and ribs/supports were inspected by DP team after repairs.

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- (ii) Some of the tray segments were observed with minor cracks near the holes at the edge.
- (iii) The shell had assumed blackish colouration.
- (iv) Thick, hard and sticky scaling was observed on the shell inside surface.
- (v) Wear plates provided on the shell above the first tray were intact in position.
- (vi) Condition of the wear plates above bottom dished end was good. No signs of corrosion were noticed. The weld joints of the shell and dished end could not be inspected due to thick blackish layer on them.
- (II) The newly installed distribution header and its weld joints were inspected by DP test.
- (III) DP test and air and soap solution test at 3 psi was carried out for detection of leakage through 105-CA and 111-CA nozzle liners. No defects/leakage was observed during the test.
- (IV) Ultrasonic thickness measurement was carried out. The report is enclosed herewith at Annex.13.

(b) 102-EB :

Visual inspection, inspection of distribution header modification work and ultrasonic thickness measurement of the vessel shell was carried out.

- (I) The following observations were made during visual examination:-
  - (i) The distributor header support plate (old-existing) located at North-East corner was found cracked. Similarly, the welding of support located at the South-East corner with shell was found cracked. These defects were repaired by grinding and welding before installation of the modified distribution header.
  - (ii) Some tray fixing fasteners of down comers plates were found missing below tray no. 15 (North Side) and below Tray no 17 at North as well as South side.
  - (iii) The shell was found blackish in colouration.
  - (iv) Thick and sticky scales were observed on the shell inside surface.
  - (v) Wear plates provided on the shell above the first tray were in good condition and no signs of corrosion were noticed.
  - (vi) Condition of the wear plates above bottom dished end was good. No signs of corrosion were noticed. The weld joints of the shell and dished end could not be inspected due to thickness blackish layer on them.
  - (II) The newly installed distribution header and its weld joints were inspected by DP test.

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(III) DP test and air and soap solution test at 3 psi was carried out for detection of leakage through 105-CB and 111-CB nozzle liners. No defects/leakage was observed during the test.

(IV) Ultrasonic thickness measurement was carried out. The report is enclosed herewith at Annex. 14.

[03] CONDENSATE STRIPPER, 104-E :

Visual inspection and ultrasonic thickness measurement of Condensate Stripper was carried out.

(A) The following observations were made during Visual examination:-

(i) The colouration of the shell was observed to be shining grayish black from top to bottom.

(ii) The top half of the shell was found with 1 to 2 mm thick hard scales adhered to the shell.

(iii) The bottom half of the shell was observed with powder like coating which was soft also.

(iv) Below the coating/scales, the surface of the shell was found free from corrosion/pittings etc. All weld joints were also in good condition.

(v) On the bottom most grill, the polypropylene rings were found accumulated in the form of lumps and in melted condition sticking to the grill.

(B) Ultrasonic thickness measurement was carried out. The report is enclosed herewith at Annex. 15.

[04] STEAM DRUM, 101-F :

Visual inspection and ultrasonic thickness measurement of Steam drum was carried out. The following were the observations :

(i) The shell had assumed greyish black colouration.

(ii) Some scattered pittings and millscale were observed on dish ends and shell.

(iii) East side separator plate (first plate from north) was found fallen/dislocated from its position which was informed to Shift Incharge (Amm) for corrective action.

(iv) Ultrasonic thickness measurement was carried out. The report is enclosed herewith at Annex. 16.

[05] RAW GAS SEPARATOR, 102-F :

(a) Visual inspection of Raw Gas Separator was carried out. The following were the observations :

(i) Epoxy painting was found to be damaged at scattered location on vessel inside surface.

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(ii) Condensate outlet nozzle (6" dia.) welding with bottom dished end was found to be corroded causing a cavity (20mm wide X 7mm deep approx) on circumference of nozzle.

Note: This nozzle was repaired by grinding and rewelding. Preheating was carried out during welding. Hardness was also measured before welding, after welding and after Post weld heating. D.P. test was carried out and no defect was observed in the rectified area.

(iii) Minor pitting/corrosion was observed on ID and face of inlet nozzle.

(b) Ultrasonic thickness measurement of shell, top dished end and condensate outlet nozzle was carried out. The report is enclosed at Annex. 17.

[06] REFLUX DRUM, 103-F :

Visual inspection and Ultrasonic thickness measurement of Reflux drum was carried out. The following were the observations :

- (i) Shell internals were observed to be in good condition.
- (ii) Grey Epoxy paint applied inside the shell was found to have peeled from scattered locations particularly on bottom half portion of the shell.
- (iii) Bottom dished end internal surface was in good condition.
- (iv) Reflux MEA nozzle located at the centre of the bottom dish end was in good condition.
- (v) Some corrosion was observed on the fillet weld of manhole on bottom half location in about 6" length.
- (vi) Some corrosion had taken place on half circumference (on west side) of the ID of CO2 outlet nozzle pipe located above manhole on north side.
- (vii) Demister pad was found to be in good condition.
- (viii) Weld joints of the vessel could not be inspected as Epoxy paint was applied over it.
- (ix) Ultrasonic thickness measurement was carried out. The report is enclosed herewith at Annex. 18.

[07] 103-J LP Case Suction Separator, 104-F :

Visual inspection and ultrasonic thickness measurement of 103-J LP Case Suction Separator was carried out. The following were the observations :

- (i) The shell had assumed brownish black colouration.
- (ii) Weld joints i.e. Circumferential seam and long seam were found to be in good condition and free from any corrosion.
- (iii) Centre drain nozzle (115-C tube side outlet) on bottom dished end and nozzle on north side were also found in good condition and free from corrosion.

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(iv) Demister pad was found to be in good condition.

(v) Ultrasonic thickness measurement of shell and dished ends was carried out. The report is enclosed herewith at Annex.19.

[08] SYNTHESIS GAS SUCTION KNOCKOUT DRUM,105-F :

Visual inspection and ultrasonic thickness measurement of Synthesis Knockout drum was carried out. The following were the observations :

- (i) The shell had assumed blackish brown colouration.
- (ii) Weld joints of the vessel and nozzles were found to be in good condition.
- (iii) Centre drain nozzle on bottom dished end and nozzle on north side (129-0 tube side outlet) were found in good condition.
- (iv) Demister pad was found to be in good condition.
- (v) One bolt of circular holding strip for demister pad was found missing.
- (vi) Scattered minor pittings were observed throughout the shell.
- (vii) Ultrasonic thickness measurement of shell and dished ends was carried out. The report is enclosed herewith at Annex.20.

[09] AMMONIA SEPARATOR,106-F :

Visual inspection and ultrasonic thickness measurement of Ammonia Separator was carried out.

- (a) The following were the observations of visual inspection :
  - (i) The shell and dished end had assumed blackish colouration.
  - (ii) All the weld joints of the shell and dished ends were found to be in good condition.
  - (iii) All other internal fittings like baffle plates, gas inlet pipe etc. were found intact in position.
  - (iv) Demister pad condition was found to be satisfactory.
- (b) In the approachable areas, Magnetic particles testing of weld joints was carried out. No defect was observed during the test.
- (vii) Ultrasonic thickness measurement of shell and dished ends was carried out. The report is enclosed herewith at Annex.21.

[10] PRIMARY AMMONIA SEPARATOR,107-F :

Visual inspection and Ultrasonic thickness measurement work was carried out.

- (a) The following observations were made during visual examination:-
  - (i) In general, the shell had assumed greyish black colouration.

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	<p>(ii) All the weld joints of shell were found in good condition.</p> <p>(iii) Shallow scattered pittings were observed on shell. These appear to be from manufacturing stage.</p> <p>In general, the condition of the vessel is quite satisfactory.</p> <p>(b) Ultrasonic thickness measurement of shell, north and south dished ends was carried out. The Report is enclosed at <u>Annex.22</u></p> <p><b>[11] PURGE GAS SEPARATOR, 108-F :</b></p> <p>Visual inspection and Ultrasonic thickness measurement were carried out .</p> <p>(a) The following observations were made during visual examination:-</p> <p>(i) The demister pad and its supports were in good condition.</p> <p>(ii) All the weld joints and shell inside surface were found free from corrosion.</p> <p>(iii) The antiwhirl baffle and inlet baffle were in good condition.</p> <p>In general, the condition of the vessel is quite satisfactory.</p> <p><b>[12] REFRIGERANT FLASH DRUMS, 110-F, 111-F AND 112-F :</b></p> <p>Visual inspection of the internals of all drums and ultrasonic thickness measurement of 112-F was carried out .</p> <p>(A) The following were the observations made during Visual examination:-</p> <p>(i) The shell had assumed blackish colouration.</p> <p>(ii) All the weld joints were found free from any sign of corrosion.</p> <p>(iii) Oil layer was found on the surface of the shell.</p> <p>(iv) The Demister pads were also found in good condition and intact in position.</p> <p>In general, no abnormality was noticed and all the vessels were in satisfactory condition for operation.</p> <p>(B) Ultrasonic thickness measurement was carried out for 112-F. The report is enclosed herewith at <u>Annex. 23.</u></p> <p><b>[13] MEA STORAGE TANK, 114-F:</b></p> <p>Visual inspection of the tank internals and ultrasonic thickness measurement was carried out.</p> <p>(a) The following observations were made during visual inspection:</p> <p>(i) The colouration of the shell was brownish.</p>

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	<p>(ii) The overall condition of the weld joints was found satisfactory. No sign of corrosion could be noticed.</p> <p>(iii) The heating coil clamps were found intact in position and properly fastened.</p> <p>In general, the overall condition of the tank was satisfactory.</p> <p>(b) Ultrasonic thickness measurement of shell and bottom plate was carried out. The report is attached herewith at <u>Annex. 24</u>.</p> <p><b>[14] STARTUP HEATER,102-B :</b></p> <p>Visual inspection,Ultrasonic thickness measurement of tubes and insitu metallography were carriedout .</p> <p>(I) The following observations were made during visual examision:-</p> <p>(i)The tubes were found free from corrosion.</p> <p>(ii)All the support clamps were intact in position.</p> <p>(iii)The refractory lining was in general in good condition except some minor spalling of top layer which was noticed at two locations.</p> <p>(II)The insitu metallography on two spots on each coil(i.e.total four spots for two coils) was carriedout by PDIL metallography team.The microstructure was reported to be normal.(See Annex.6)</p> <p>(III) Ultrasonic thickness measurement was carriedout for the tubes.Necessary scaffolding for safe approach was prepared for undertaking thickness measurement.Min. Thickness was observed tobe 10.4 MM against the design thickness of 8.89 MM.</p>
01 41 05	<p><b><u>MISCELLANEOUS JOBS:</u></b></p> <p><b><u>(1) WELDERS QUALIFICATION TEST:</u></b></p> <p>Qualification tests were performed for the welders employed by the contractors M/S. J.M.Engineers, Ahmedabad for cooling water line and Ammonia plant CO2 Stripper 102-EA/EB Header modification work, M/S. Jaihind Projects for underground cooling water piping fabrication and erection job, M/s. L &amp; T for Autoclave modification work and M/S. General Engg. who supplied daily rated IBR and Non-IBR welders for miscellaneous plant jobs during the shutdown.</p> <p>(2) D.P. test of the 104-J Terry turbine rotor was carried out after removal. A crack was observed on the shroud of one wheel and hence it was decided to replace the rotor by spare one and the defective rotor was not used.</p> <p>(3) D.P.test on 104-C Bypass line(12" and 8" NB) joints- one each was carried out after edge preparation,root weld and final welding. Radiography was also carried out. Necessary repairs were carried out as observed during radiography and finally both the joints were cleared in DPT and Radiography.</p>

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(4) Hardness measurement on 66 nos. 1 1/2 " NB nipples to be used by L & for Primary Reformer Arch Burners was carried out. Chemical analysis of two samples having different hardness was carried out at M/S. Ratnamani Tubes for confirmation of the material. It was observed that some of the nipples were of low alloy steel material instead of plain carbon steel material as specified in the order.

[D] Ultrasonic Flaw detection of the critical pipe lines weld joints was carried out. Wherever defect indications were observed, confirmatory radiography shots were taken. The details of the pipe lines scanned including the location of the weld joints etc. is given at the Annex 25 enclosed herewith.

[E] Ultrasonic thickness measurement on a large number of pipe lines in Ammonia plant was carried out to evaluate their condition and thickness reduction. A list of the pipe lines which were tested for thickness and the details on their design thickness, measured thickness, max. percentage of reduction with reference to the design thickness etc. are given at the Annex 26 attached herewith. The following pipe lines are recommended for replacement based on the observations and the thickness readings:

1. DM-1-8" ( 106-C to 101-U ) : The min. thickness is found to be 3.2 MM against the design thickness of 8.18 MM i.e. 60.88 % reduction in thickness. It is therefore suggested to replace this pipe line at the earliest opportunity. ( see Annex -27(1) )

2. PW-2-2" ( PW-3 to LC-3 ), PW-3-2" ( PW-4 to PW-12 ),  
PW-4-2.5" ( PW-1 to 106-J ), PW-5-2" ( 106-J to PG-10 )

In general, loss of wall thickness is ranging from 35 % to 49 % in all the above pipe lines. It is therefore suggested to replace all the four pipe loops as mentioned above. ( see Annex. 27(2),27(3),27(4) & 27(5) )

3. SG-13-12" ( 124-C to SG-14 ) : The min. thickness observed in this pipe line is 19.2 MM against the design thickness of 21.4 MM. However, as per the design calculations made by General Engg. Section, minimum required thickness including corrosion allowance is 19.57 Mm and without corrosion allowance, it is 18.3 MM. It is therefore recommended to plan the replacement of this pipe line. (see Annex. 27(6) )

4. SG-35-12" (121-C to 103-J) : The minimum thickness is observed to be 20.1 MM against the design thickness of 21.4 MM i.e. 6 % reduction thickness as compared to the original thickness. However, as per the design calculations performed by General Engg. Section, the min. required thickness including corrosion allowance is 19.52 MM. It is therefore suggested to plan the replacement of this pipe line. (see Annex. 27(7) )

The ultrasonic thickness measurement reports of all the above referred lines are attached herewith at Annex.27.

( DETAIL INSPECTION REPORT CAN BE SEEN IN INSPECTION SECTION WITH ALL ANNEXURES )

AMMONIA PLANT PIPELINES:

SR NO	LINE NO.	N.B. (Inch)	SCH./MM	MATERIAL	LINE DESCRIPTION FROM	TO	MIN THK SD97 MM	% RED	REMARKS
PROCESS AIR LINES :-									
1	A-20	10	20/6.35	C.S.	101 J	101 B	6.1	3.9	
2	A-22	4	40/6.02	F-11	A 20 SPEC.BRK	SPEC. BRK NG-9	5.0	16.94	
3	A-25	6	40/7.11	CS	A 20	A-27	7.0	-	
4	A-27	8	40/7.11	CS	A-25	SILENCER	7.1	-	
5	A-31	1.5	80/5.08	CS	A-20	A-27	4.9	5.5	
BOILER FEED WATER LINES:									
1	BF-2H	6	120/14.27	CS	101-F	101-B	13.6	4.7	
2	BF-1	12	20/6.35	CS	101-U	HEADER	6.2	-	
3	BF-2	10	20/6.35	CS	BF-1	104-J	6.3	-	
4	BF-3	10	20/6.35	CS	BF-1	104-JA	6.9	7.08	
5	BF-4	6	80/10.97	CS	104-JA	BF-22	10.9	1.58	
6	BF-7	6	80/10.97	CS	104-J	BF-22	11.2	-	
7	BF-15	5	90/10.97	CS	125-C	BF-1 H	9.6	12.5	
8	BF-17	3	80/7.62	CS	114-C	BF-3H	6.7	12.07	
9	BF-21	2	160/9.71	CS	BF-22	HEADER	10.9	-	
10	BF-35	4	40/6.02	CS	125-J	BF-22	8.0	-	
CARBON DI-OXIDE LINES :-									
1	CO-1A	18	30/11.13	CS	102-EA	CO-17	9.9	11.03	
2	CO-1B	18	30/11.13	CS	102-EB	CO-16	9.1	18.24	
3	CO-2A	18	30/11.13	CS	CO-17	110-CA	10.9	2.06	
4	CO-2B	18	30/11.13	CS	CO-16	110-CB	11.0	-	
5	CO-3A	18	30/11.13	CS	CO-17	110-CA	10.9	4.4	
6	CO-3B	18	30/11.13	CS	CO-16	110-CB	11.3	-	
7	CO-6A	18	30/11.13	CS	110-CA	CO-7	9.3	16.44	

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AMMONIA PLANT PIPELINES:

SR NO	LINE NO.	N.B. (Inch)	SCH./MM	MATERIAL	LINE DESCRIPTION FROM	TO	MIN THK SD97 MM	% RED	REMARKS
8	CO-6B	18	50/11.13	CS	110-CB	CO-7	9.7	12.94	
	DEMIN WATER LINES:-								
1	DM-1	8	40/9.18	ALUM	108-C	101-U	3.2	80.88	REPLACEMENT RECO.
2	DM-2	6	40/7.11	ALUM	DM-9, 9A	108-C	7.0	-	
3	DM-7	8	40/7.11	ALUM	BATT.LIMIT	2002-F	7.0	-	
4	DM-8A	6	40/7.11	ALUM	DM-9	2004-JA	6.9	-	
5	DM-9	4	40/6.02	ALUM	2004-J	DM-2	5.6	6.97	
6	DM-9A	4	40/6.02	ALUM	2004-JA	DM-2	5.6	6.97	
	LOW PRESSURE STEAM LINES:-								
1	LS-1	12	20/6.35	CS	LS-2	LS-4	6.0	5.5	
2	LS-2	5	40/5.5	CS	HEADER	LS-1	6.1	7.27	
3	LS-3	12	20/6.35	CS	HEADER	LS-4	9.2	-	
4	LS-8	10	20/6.35	CS	BATTERY LIMITS	LS-3	9.2	-	
5	LS-10	8	20/6.35	CS	LS-8	LS-1	7.9	-	
6	LS-17	12	20/6.35	CS	LS-4	111-CB	6.1	3.9	
7	LS-18	12	20/6.35	CS	LS-1	PIC-20	6.1	3.9	
8	LS-21	10	20/6.35	CS	104-JA	LS-3A	6.2	-	
9	LS-24	8	20/6.35	CS	101-B	LS-3	9.2	-	
10	LS-25	8	20/6.35	CS	112-C	LS-1	6.5	-	
	CO2 ABSORBER LINES :-								
1	MEA-1	12	30/8.38	SS	101-E	MEA-4B	9.1	-	
2	MEA-2	4	40/6.02	SS	MEA-1	101-L	5.4	10.29	
3	MEA-3	4	40/6.02	SS	101-L	MEA-1	5.6	6.97	
4	MEA-8A	8	40/9.2	SS	109-C1A	MEA81	8.3	-	

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AMMONIA PLANT PIPELINES:

SR NO	LINE NO.	N.B. (Inch)	SCH./MM	MATERIAL	LINE DESCRIPTION FROM	TO	MIN THK SD97 MM	% RED	REMARKS
5	MEA-6B	8	40S/9.2	SS	109-C1B	MEA61	8.2	-	
6	MEA-7	12	40S/9.5	SS	MEA-61	MEA-9A & B	8.6	9.47	
7	MEA-8	12	50/9.58	CS	MEA-19 & 18	MEA-20	7.9	5.72	
8	MEA-9A	10	40S/9.27	SS	MEA-7	CON.VALVE	8.5	8.3	
9	MEA-9A	8	40S/9.19	SS	MEA-7	CON.VALVE	7.8	4.8	
10	MEA-9B	10	40S/9.27	SS	MEA-7	CON.VALVE	8.7	6.1	
11	MEA-9B	8	40S/9.2	SS	MEA-7	CON.VALVE	8.0	2.4	
12	MEA-13A	12	20/6.35	CS	109C2A	MEA-60	6.4	-	
13	MEA-13B	12	20/6.35	CS	109C2B	MEA-60	6.5	-	
14	MEA-14	14	20/7.92	CS	MEA-16	MEA-13A & B	7.1	10.38	
15	MEA-15A	12	20/6.35	CS	MEA-14	109C1A	8.9	-	
16	MEA-15B	12	20/6.35	CS	MEA-14	109C1B	8.7	-	
17	MEA-16A	12	20/6.35	CS	109C2A	MEA-62	7.2	-	
18	MEA-16B	12	20/6.35	CS	109C2B	MEA-62	7.2	-	
19	MEA-17	16	20/7.92	CS	MEA-62	MEA-41	7.6	4.64	
20	MEA-18A	10	20/6.35	CS	MEA-41	107-JA	8.4	-	
21	MEA-18B	10	20/6.35	CS	MEA-41	107-JB	8.7	-	
22	MEA-18C	10	20/6.35	CS	MEA-42	107-JC	8.9	-	
23	MEA-18D	10	20/6.35	CS	MEA-42	107-JD	8.0	-	
24	MEA-20	12	50/9.58	CS	MEA-21+9	101-E	7.9	5.72	
25	MEA-21	12	50/9.58	CS	MEA-19C+D	MEA-20	8.0	-	
26	MEA-22	4	40/6.0	CS	109-F	MEA-23A,B	6.0	-	
27	MEA-23A	4	40/6.0	CS	MEA-22	109-J	6.1	-	
28	MEA-23B	4	40/6.0	CS	MEA-22	109-JA	6.1	-	
29	MEA-24A	3	40/5.0	CS	108-J	MEA-25	6.1	-	

AMMONIA PLANT PIPELINES:

SR NO	LINE NO.	N.B. (Inch)	SCH./MM	MATERIAL	LINE DESCRIPTION		MIN THK SD97 MM	% RED	REMARKS
					FROM	TO			
30	MEA-24B	3	40/5.5	CS	108-JA	MEA-25	6.2	-	
31	MEA-26A	2.5	40/5.2	CS	MEA-25	102-EA	5.1	1.1	
32	MEA-26B	2.5	40/5.2	CS	MEA-25	102-EB	5.1	-	
33	MEA-30	2	80/5.5	CS	MEA-11	115-C	5.5	-	
34	MEA-36	2	80/5.5	CS	111-J	CO-7	5.5	-	
35	MEA-41	16	20/7.92	CS	MEA-17	MEA-19A + B	6.9	-	
36	MEA-42	16	20/7.92	CS	MEA-17	MEA-19C+D	7.6	4.04	
37	MEA-60	14	20/7.92	CS	HEADER	MEA-14	7.7	2.77	
38	MEA-61	12	40/9.5	SS	MEA-CA/CB	MEA-7	9.2	3.15	
37	MEA-82	16	20/7.92	CS	HEADER	MEA-17	7.2	9.09	
MEDIUM PRESSURE STEAM LINES: -									
1	MS-1	8	30/7.04	CS	MS-2	HEADER	6.8	3.40	
2	MS-2	12	30/8.38	CS	HEADER	MS-1	9.2	2.14	
3	MS-3	12	30/8.38	CS	MS-11	MS-2	8.4	-	
4	MS-9	10	100/19.24	CS	MS-12	MS-2	17.6	3.50	
5	MS-11	16	30/9.525	CS	103-J	MS-3	9.5	11.8	
6	MS-12	9	100/15.06	CS	MICA-22	MS-9	13.6	9.69	
7	MS-13	9	100/15.06	CS	PIC-13B	MS-9	13.5	10.35	
8	MS-14	9	100/15.06	CS	PIC-13A	MS-9	14.2	5.71	
9	MS-19	6	40/7.11	CS	MS-1	107-JAT	6.3	11.39	
10	MS-22	4	40/6.02	CS	MS-2	MS-55	6.2	-	
11	MS-23	8	30/7.0	CS	MS-60	104-J	7.9	-	
12	MS-24	8	30/7.0	CS	MS-60	104-JA	7.0	-	
13	MS-29	12	30/8.4	CS	MS-2	NG-8	8.0	4.76	

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AMMONIA PLANT PIPELINES:

SR NO	LINE NO.	N.B. (Inch)	SCH./MM	MATERIAL	LINE DESCRIPTION		MIN THK SD97 MM	% RED	REMARKS
					FROM	TO			
14	MS-52	4	40/8.02	CS	MS-38	101-BJ	7.0	-	
15	MS-55	6	40/7.11	CS	MS-11	103-J	7.3	-	
16	MS-60	10	30/7.9	CS	MS-2	HEADER	9.9	-	
NATURAL GAS LINES :-									
1	NG-1	6	40/7.11	CS	BATT.LIMIT	NG-2	7.0	-	
2	NG-2	6	40/7.11	CS	NG-1	101-D	6.4	9.98	
3	NG-3	6	40/7.11	CS	NG-1	102-D	6.5	8.57	
4	NG-4	6	40/7.11	CS	101-D	NG-6A	6.8	4.36	
5	NG-5	6	40/7.11	CS	102-D	NG-6A	6.7	5.76	
6	NG-7	8	20/6.4	CS	101-B	NG-B	6.7	-	
7	NG-8	12	30/8.4	CS	NG-7	101-B	8.5	-	
8	NG-9	12	100/21.4	P-11	101-B	NG-11	21.3	-	
9	NG-11A	6	120/14.3	P-11	NG-9	101-B	14.5	-	
10	NG-11B	6	120/14.3	P-11	NG-9	101-B	14.0	-	
11	NG-11C	6	120/14.3	P-11	NG-9	101-B	14.0	-	
12	NG-11D	6	120/14.3	P-11	NG-9	101-B	14.3	-	
13	NG-11E	6	120/14.3	P-11	NG-9	101-B	13.8	4.89	
14	NG-11F	6	120/14.3	P-11	NG-9	101-B	14.7	-	
15	NG-11G	6	120/14.3	P-11	NG-9	101-B	13.8	3.49	
16	NG-11H	6	120/14.3	P-11	NG-9	101-B	14.1	-	
17	NG-14	3	40/5.5	CS	NG-6	NG-15	6.2	-	
AMMONIA LINES :-									
1	NH-5	3	40/5.5	CS	NH-122	125-C	6.6	-	
2	NH-6	6	40/7.11	CS	125-C	NH-10	7.4	-	
3	NH-8	6	20/6.35	CS	112-F	NH-9	6.4	-	

AMMONIA PLANT PIPELINES:

SR NO	LINE NO.	N.B. (Inch)	SCH./MM	MATERIAL	LINE DESCRIPTION		MIN THK	% RED	REMARKS
					FROM	TO	SD97 MM		
4	NH-9	6	40/7.11	CS	NH-8	NH-114	6.3	11.39	
5	NH-10	20	20/9.52	CS	NH-80 A/B	112-F	10.7	-	
6	NH-14	6	40/7.11	CS	109-F	NH-25 A/B	7.0	1.5	
7	NH-15	4	40/6.02	CS	NH-17	NH-16	8.2	-	
8	NH-17	6	40/7.11	CS	109-F	NH-15	6.8	4.3	
9	NH-19	16	20/7.9	CS	111-F	105-J	8.0	-	
10	NH-20	18	20/7.92	CS	105-J	NH-106 A&B	8.2	-	
11	NH-21	18	20/7.92	CS	129-C	105-J	9.4	-	
12	NH-25	12	20/6.4	CS	105-J	NH-33	6.8	-	
13	NH-24A	12	20/6.4	CS	NH-33	127-C	6.4	-	
14	NH-24B	12	20/6.4	CS	NH-33	127-C	6.6	-	
15	NH-25A	6	40/7.11	CS	127-C	NH-14	7.2	-	
16	NH-25B	6	40/7.11	CS	127-C	NH-14	7.4	-	
17	NH-26	14	20/7.9	CS		NH-19	8.1	-	
19	NH-29A	6	40/7.11	CS	NH-113	119-C	7.1	-	
19	NH-29B	6	40/7.11	CS	NH-113	118-C	7.2	-	
20	NH-32	12	20/6.35	CS	NH-99A&B	110-F	6.1	3.9	
21	NH-34	6	40/7.11	CS	110-F	NH-112	7.0	1.5	
22	NH-37	4	40/6.02	CS	NH-34	NH-41	6.6	6.9	
23	NH-38	9	20/6.35	CS	CONTROL VALVE	NH-32	6.3	-	
24	NH-41	6	40/7.11	CS	129-C	111-F	6.7	3.7	
25	NH-45	10	20/6.35	CS	NH-70	NH-46	6.4	-	
26	NH-46	12	20/6.35	CS	NH-78A&B	111-F	6.0	3.5	
27	NH-47A	6	40/7.11	CS	NH-112	117-C	7.3	-	

AMMONIA PLANT PIPELINES:

SR NO	LINE NO.	N.B. (Inch)	SCH./MM	MATERIAL	LINE DESCRIPTION		MIN THK SD97 MM	% RED	REMARKS
					FROM	TO			
28	NH-47E	8	40/7.11	CS	NH-112	117-C	7.1	-	
29	NH-50	4	40/8.02	CS	NH-97	107-F	6.0	-	
30	NH-56	2.5	40/8.16	CS	107-F	NH-58	5.9	-	
31	NH-57	10	20/8.35	CS	110-F	NH-21	6.2	2.8	
32	NH-58	6	40/7.11	CS	NH-56	112-F	7.1	-	
33	NH-59	2.5	40/8.16	CS	NH-56	NH-119	5.1	-	
34	NH-69	10	20/8.4	CS	NH-23	NH-108	5.9	9.37	
35	NH-69	6	40/7.11	CS	CONTROL VALVE		7.1	-	
36	NH-70	6	40/7.11	CS	NH-69	CONTROL VALVE	7.2	-	
37	NH-75	10	20/8.4	CS	NH-108	NH-10	6.5	-	
38	NH-78A	10	20/8.35	CS	119-C	NH-46	6.5	-	
39	NH-79B	10	20/8.35	CS	119-C	NH-46	6.5	-	
40	NH-79A	6	20/7.11	CS	NH-114	119-C	7.0	1.5	
41	NH-79B	6	20/7.11	CS	NH-114	119-C	7.0	1.5	
42	NH-80A	16	20/7.9	CS	119-C	NH-10	9.2	-	
43	NH-80B	16	20/7.9	CS	119-C	NH-10	9.4	-	
44	NH-98A	8	20/8.35	CS	117-C	NH-52	6.1	3.9	
45	NH-98B	8	20/8.35	CS	117-C	NH-52	6.5	-	
46	NH-108	8	40/7.11	CS	CONTROL VALVE		7.1	-	
47	NH-112	9	20/8.35	CS	HEADER	117-C	7.9	-	
48	NH-113	8	20/8.35	CS	HEADER	118-C	6.5	-	
49	NH-114	8	20/8.4	CS	HEADER	119-C	6.0	6.25	
50	NH-116	6	40/7.1	CS	112-F	NH-117A&B	6.9	2.81	
51	NH-117A	6	40/7.1	CS	NH-116	GATE	6.2	12.67	
52	NH-117B	6	40/7.1	CS	NH-116	GATE	5.9	16.9	

AMMONIA PLANT PIPELINES:

SR NO	LINE NO.	N.B. (Inch)	SCH./MM	MATERIAL	LINE DESCRIPTION FROM	TO	MIN THK SD97 MM	% RED	REMARKS
33	NH-118A	3	40/3.3	CS	118-J	NH-119	3.6	-	
34	NH-118B	3	40/3.3	CS	118-JA	NH-119	3.6	-	
35	NH-119	3	40/3.3	CS	119-A&B	CONTROL VALVE	3.3	3.63	
36	NH-121	6	40/7.1	CS	NH-35	112-F	6.1	14.08	
	PROCESS GAS LINES :-								
1	PG-7	12	30/9.98	CS	PG-6	104-C	9.8	-	
2	PG-11A	16	30/9.52	SS	PG-21	105-CA	11.1	-	
3	PG-11B	18	30/9.52	SS	PG-21	105-CB	9.9	7.56	
4	PG-12A	14	30/9.52	SS	105-CA	PG-26	11.3	-	
5	PG-12B	14	30/9.52	SS	105-CB	PG-26	11.2	-	
6	PG-14	16	40/12.7	CS	106-C	102-F	7.9	39.99	MIN.REQD THK 4.67MM
7	PG-17	14	20/7.9	CS	136-C	104-C	9.2	-	
8	PG-18	12	30/9.4	P-11	104-C	106-D	7.9	7.14	
9	PG-19	14	STD/9.525	CS	PG-8	PG-9	11.1	-	
10	PG-20	8	20/6.4	CS	PG-9	PG-10	9.2	-	
11	PG-21	20	30/12.7	SS	PG-10	PG-11A&B	12.3	3.14	
12	PG-22	6	80/11.0	CS	PG-15	RV-102F	10.9	-	
13	PG-24	10	30/7.8	P-11	PG-17	PG-18	6.3	19.23	
14	PG-26	18	30/11.13	SS	HEADER	PG-12A/B	11.0	-	
15	PG-34	6	40/7.11	SS	PG-33A&B	PG-13	10.1	-	
16	PG-35	18	40/14.27	CS	112-C	137-F	9.5	33.42	MIN.REQD THK 5.9MM
	PROCESS WATER LINES :-								
1	FW-1	6	80/10.97	CS	102-F	FW-4	10.7	-	
2	FW-2	2	160/9.7	CS	FW-3	LC-3	4.7	43.97	REPLACEMENT RECO.

AMMONIA PLANT PIPELINES:

SR NO	LINE NO.	N.B. (Inch)	SCH./MM	MATERIAL	LINE DESCRIPTION FROM	TO	MIN THK SD97 MM	% RED	REMARKS
3	PW-3	2	160/8.7	CS	PW-4	PW-12	5.6	33.63	REPLACEMENT RECO.
4	PW-4	2.5	160/8.7	CS	PW-1	106-J	4.5	48.27	REPLACEMENT RECO.
5	PW-5	2	160/8.7	CS	106-J	FG-10	4.6	47.12	REPLACEMENT RECO.
	11 ATA.	STEAM	LINES :-						
1	S-5	6	40/7.11	CS	S-7	HEADER	6.9	-	
2	S-7	6	40/7.11	CS	MS-34	S-5	7.2	-	
3	S-9	6	40/7.11	CS	S-5	LS-10	7.0	-	
4	S-10	4	40/6.02	CS	S-7	S-13	5.8	3.65	
5	S-11	6	40/7.11	CS	S-5	104-D	6.7	5.76	
	STEAM	COND.	LINES :-						
1	SC-4	4	40/6.02	CS	111-CB	SC-6	5.2	13.62	
2	SC-5	4	40/6.02	CS	111-CA	SC-8	5.3	11.96	
3	SC-6	4	40/6.02	CS	SC-4&5	SC-9	5.9	1.99	
4	SC-41A	4	40/6.02	CS	112D	SC-12	6.7	-	
5	SC-41B	4	40/6.02	CS	112JA	SC-41A	6.6	-	
6	SC-42	4	40/6.02	CS	CV-A	LC-2	7.9	-	
7	SC-47A	10	20/6.35	CS	101-JC	112-J	6.5	-	
9	SC-47B	10	20/6.35	CS	101-JC	112-JA	6.2	2.4	
9	SC-70	1.5	80/5.1	CS	SC-20	103-DJKT	4.2	17.6	
10	SC-71	4	80/6.02	CS	SC-20	101-CA&B	7.1	-	
	SYN.	GAS	LINES :-						
1	SG-5	14	20/7.92	CS	115-C	104-F	7.4	6.56	
2	SG-6	12	20/6.35	CS	104-F	103-J	6.0	5.51	
3	SG-7	10	60/12.7	CS	103-J	136-C	12.1	4.72	

AMMONIA PLANT PIPELINES:

SR NO	LINE NO.	N.B. (Inch)	SCH./MM	MATERIAL	LINE DESCRIPTION		MIN THK SD97 MM	% RED	REMARKS
					FROM	TO			
4	SG-8	10	40/9.27	CS	136-C	116-C	8.8	-	
5	SG-9	10	40/9.27	CS	116-C	129-C	9.1	-	
6	SG-10	10	40/9.27	CS	127-C	105-F	10.1	-	
7	SG-12	14	100/25.9	CS	103-J	124-C	22.9	3.78	
8	SG-13	12	100/21.41	CS	124-C	SG-14	19.2	10.32	PLAN REPLACEMENT MIN.REQ THK=19.37MM
9	SG-15	10	100/19.24	CS	117-C	118-C	16.2	11.18	
10	SG-16	10	100/19.24	CS	119-C	SG-17	17.2	5.10	
11	SG-17	14	100/25.8	CS	SG-16	119-C	22.7	4.62	
12	SG-19	14	100/25.8	CS	106-F	120-C	25.3	2.10	
13	SG-21	14	120/27.78	CS	121-C	SG-22 & 23	25.2	9.22	
14	SG-33	14	140/31.75	F-22	122-C(105-D)	123-C	32.6	-	
15	SG-34	14	120/27.79	F-11	125-C	121-C	25.6	7.98	
16	SG-35	12	100/21.41	CS	121-C	103-J	20.1	6.0	PLAN REPLACEMENT MIN.REQ.THK=19.32MM
17	SG-36	2.5	90/7.01	CS	SG-35	125-C	6.2	11.55	
18	SG-37	2.5	90/7.01	CS	125-C	108-F	6.3	10.12	
19	SG-38	2.5	90/7.01	CS	108-F	SG-39	7.2	-	
20	SG-40	10	100/19.24	CS	SG-3	120-C	17.4	4.80	
21	SG-41	10	100/19.24	CS	120-C	SG-17	18.2	-	
22	SG-42	4	90/8.56	CS	SG-51	SG-11	7.2	15.98	
23	SG-51	8	100/15.1	CS	CONT.VALVE	FICV-15	14.5	3.97	
24	SG-52	3	160/11.13	CS	SG-22	EVPT-DISCH	10.8	2.98	
25	SG-53	3	160/11.13	CS	SG-22	EVPT-DISCH.	10.8	2.98	
26	SG-76A	4	120/11.1	CS	SG-23	102-B	11.1	-	
27	SG-76B	4	120/11.1	CS	SG-21	102-B	11.4	-	

Annex-26(II)

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AMMONIA PLANT PIPELINES:

SR NO	LINE NO.	N.B. (inch)	SCH/MM	MATERIAL	LINE DESCRIPTION FROM	TO	MIN THK 3D97 MM	% RED	REMARKS
28	3G-79	1	80/4.5	CS	105F	LC-10	5.0	-	
BOILER WATER LINES :-									
1	BW-1H	14	100/29.80	CS	101-CA	BW-4DHA,HS	29.9	-	
2	BW-3H	12	100/21.41	CS	102-C	101-F	22.9	-	
3	BW-4H	10	100/19.24	CS	101-F	102-C	19.1	-	
4	BW-5H	14	100/29.80	CS	101-CE	BW-4S HA,HB	29.2	-	
5	BW-9H	12	100/21.41	CS	HEADER	105-C	17.9	16.59	
6	BW-9H	8	100/15.06	CS	105-C	BW-8H	15.8	-	
7	BW-10H	8	100/15.06	CS	105-C	BW-8H	14.9	1.06	
8	BW-11H	8	100/15.06	CS	BW-14H	105-C	14.9	1.06	
9	BW-12H	8	100/15.06	CS	BW-14H	105-C	14.7	2.39	
10	BW-14H	10	100/19.24	CS	HEADER	105-C	17.2	5.70	
11	BW-25H	8	100/15.06	CS	101-F	BW-15 H	14.9	1.06	
12	BW-35H	14	100/29.80	CS	101-CA	BW-41 HA,HB	22.4	5.89	
13	BW-36H	14	100/29.80	CS	101-CE	BW-45 HA,HB	24.2	-	
14	BW-40HA	12	100/21.41	CS	BW-1H	101-F	22.2	-	
15	BW-40HB	12	100/21.41	CS	BW-1H	101-F	22.9	-	
16	BW-41HA	12	100/21.41	CS	BW-35H	101-F	21.9	-	
17	BW-41HB	12	100/21.41	CS	BW-35H	101-F	22.4	-	
18	BW-43HA	12	100/21.41	CS	BW-3H	101-F	25.6	-	
19	BW-43HB	12	100/21.41	CS	BW-3H	101-F	22.9	-	
20	BW-45HA	12	100/21.41	CS	BW-36H	101-F	22.4	-	
21	BW-45HB	12	100/21.41	CS	BW-36H	101-F	22.7	-	

PLANT TURNAROUND - MAY - JUNE 1997AMMONIA PLANT

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CIVIL JOBS


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 JOB CODE            JOB DISCRIPTION
 

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01 51 01 CIVIL JOBS :(A) AUXILIARY BOILER

1. Refractory patch work on sides of burner No.1 to 5.
2. Pointing the insulating brick by TOWELZO QUICK AIR SETTING MORTER.
3. Making scaffolding for Refractory work.
4. Insulyte casing on side of H.T.Wall.
5. Removing damaged refractory lining of front side header and re-casing the same by PLI CAST - 40.
6. Target wall repairs.
7. Header side wall repairs.

(B) PRIMARY REFORMER (RADIANT ZONE ) :

1. Replacement of tunnel block.
2. Removing and Re-lining insulating brick work on east side of wall near newly fixed manhole.
3. Making gap for new manhole.
4. Crack filling and joint filling by "CERAWOOL".
5. Cleaning of radiant zone.
6. Opening and closing manhole.

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

1. Removing refractory from ceiling of transit zone.
2. Insulating casting with gunniting by Sahani Associates, including welding, hold fast fixing , G.I.chain link fencing.
3. Repairing work on side of L.T.zone and H.T.zone by insulating gunniting work.

(D) OPENING OF PIPE LINE :

1. Opening of C.W.Line near N.G.Compressor.
2. Opening of C.W.line near 108-C.
3. Opening of C.W.line new 103-J.

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PLANT TURNAROUND - MAY - JUNE 1997

AMMONIA PLANT

ELECTRICAL JOBS

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JOB CODE            JOB DISCRIPTION

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01 61 01    ELECTRICAL JOBS :

1. Preventive maintenance carried out on TR-6 .
  - a) Inspected primary and secondary cable boxes, end terminations, checked and tightened connections.
  - b) Tested oil in marshalling boxes on primary and secondary sides of transformer and cleaned chamber and replaced oil if required.
  - c) Replacement/reactivating of silicagel in dehydrating breather of above transformer
  - d) Trip alarm circuit was checked and cleaned of all emergency trip boxes
  - e) Checked IR value of primary and secondary windings of above transformers
2. Preventive maintenance of TMG make LT ACBs installed at MCC was carried out and damaged parts and worn out contacts were replaced.
3. Indicating lamps of breaker pannel were replaced.
4. Preventive maintenance was carried out on all feeder compartments mounted on the following MCCs :-  
MCC-5, MCC-5A, MCC-5B
5. Tested all type of relays installed in the above MCCs.
6. Maintenance job of all lighting distribution boards was carried out and burnt out fuse fittings were replaced.
7. Overhauling of following motors  
102-J, 2004-J, 118-J, 1018JT.
8. Preventive maintenance of all motor operated valve local control panels were carried out.
9. Terminal boxes for loose connections burning of cables etc. of all motors above 20 HP were checked.

PLANT TURNAROUND - MAY - JUNE 1997AMMONIA PLANT

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INSTRUMENT JOBS

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<u>JOB CODE</u>	<u>JOB DISCRIPTION</u>
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01 71 01 INSTRUMENT JOBS :01) CONTROL VALVES:

- A) PICV-28 Valve was removed from line. Dismantled it. Overhauling of all parts were done. Its positioner, regulator was checked. Filled gland packing. Finally Valve diaphragm was checked for leakage found o.k. Valve was fixed in line. its stroke was checked locally and from control room found o.k.
- B) MICV-32 Valve was removed from line. Found its plug damaged. Dismantled it. Overhauling of valve, its positioner and regulator was done. Replaced the damaged plug with new one. Finally valve diaphragm was checked for leakage found ok. Valve was fixed in line. its stroke was adjusted and then checked found ok.
- C) FICV-200 Valve was removed from line as it was passing. Found its plug/seat damaged. New seat was made in workshop, also taken fine cut on plug. Fixed the new seat & plug. Overhauling of valve, its positioner, regulator was done. finally valve diaphragm was checked for leakage found ok. Valve was fixed in line. its stroke was adjusted & then checked, found ok.
- D) FICV-202 Valve was removed from line for maintenance. Broken stud of gland box from bonet was removed in mechanical workshop. Provided new gland packings. General maint. of valve, its positioner was carried over. Finally valve was fixed in line. While tightening the valve one stud of bonnet was broken, so replaced all studs with new studs. Valve assembly completed, checked its stroke. found o.k.
- E) FICV-14 General maint. of valve, its positioner & regulator was carried out over. Provided new lock nut for actuator locking. Filled the gland packing. Checked the diaphragm and valve performance found o.k.
- F) FICV-12: General maint. of valve, its positioner & regulator was carried over. Base plate of valve positioner found cracked, so replaced it with new one. Also valve positioner gauges were replaced. Provided new needle valve for local receiver gauge, as old was damaged. Finally checked the diaphragm and valve performance found o.k.

JOB CODE

JOB DISCRIPTION

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- G) PICV-24 General maint. of valve, its positioner was done. Control valve signal & air supply tubing was damaged, provided new copper tubing. Also provided new mounting screw of feed back lever. Finally checked valve performance found ok.
- H) MICV-27 Valve operation was not proper, on checking found diaphragm leakage. Diaphragm replaced with new one. Also general maint. of valve was carried out.
- I) MICV-29: Valve was opening only 75%. Removed valve from line. Found diaphragm & stem seal ring bottom defective. Replaced both with new.
- J) PICV-137: Valve was removed from line for maintenance. New plug/seat & bonnet were fixed as old were defective. Also provide gland packings & general maint. of valve, positioner & regulator carried over. Checked the performance of Control Valve, found ok.
- K) LCV-13 Valve was removed from line for inspection. Found seat damaged. Replaced the seat with new. General maint. of valve, positioner & regulator done. Finally checked stroke of valve found ok.
- L) General maint./lubrication, valve positioner, regulator cleaning, diaphragm checking & stroke checking of following Control Valves were carried out.  
 FRCV-1, FRCV-2, FRCV-3, TRCV-10, TRCV-11, PICV-14, V-7, V-5, V-18, V-1, FICV-7, FICV-8, FICV-9, FICV-10, FICV-11, FICV-15, MICV-12, LCV-19, V-150, LCV-18, PRCV-1, PRCV-2, LCV-3A, LCV-20, THICV-131, TCV-181, FICV-16, FICV-17, LCV-14, LCV-15, LCV-12, PICV-7, PICV-8, LCV-16, MICV-14, MICV-15, MICV-16, MICV-17, FRCV-18, PICV-24, FRCV-5, V-27, V-3, PRCV-25, PICV-20, PRCV-4, V-650, PCV-5506, THICV-165, TRCV-11 and TRCV-10.
- M) Following Control valves were removed permanently from lines against MWO No. 15355 & 15491 dt. 25.5.97 & 26.5.97.  
 FRCV-205, V-160, LCV-24 and TICV-133.
- N) PICV-13 A & B, MICV-22: Control Valves were removed by L&T for pipe line work from lines. These were fixed back after pipe line work in our presence. General maint., lubrication & stroke checking of these valves were carried over. MICV-22 valve 3/8" oil line fitting was leaking replaced it with new one. Also oil trap tray was provided after mech/insulation work completion. Finally checked the operation of all three valves found ok.

JOB DISCRPTION

JOB CODE

- D) PRCV-1a control valve was removed by contractor from line. Fixed it after line flushing in our presence. Carried over its general maint. & checked its performance. found ok.
- P) LCV-10 was removed & fixed in line three times on the request of production people for chocking removal. After final fixing general maint. carried over & checked performance. found o.k.
- Q) MICV-61 was removed from line, as it was getting stuck up. Overhauling of valve, its positioner and air regulator was done. Also taken fine cut on plug as it was sticking in cage guide. Provided new guide bush & gland packings. Checked its performance. found ok.
- R) TRCV-12: General maint of valve, its positioner & regulator carried over. On checking found valve positioner base plate crack, this was replaced with new base plate. After that checked the performance of valve found ok.
- S) As a preventive maint following control valves were painted.  
V-27, FICV-202, LCV-12, MICV-61 and LCV-13.

02) PRIMARY REFORMER TUNNEL THERMOCOUPLES TI-1-68 to TI-1-76:

In case of TI-1-68, TI-1-70, TI-1-71, TI-1-72, TI-1-74 & TI-1-75 replaced full assemblies of T/C's with Thermowell as old units were totally damaged. In case of TI-1-69, TI-1-73 & TI-1-76 replaced thermocouple elements & made them o.k.

03) SECONDARY REFORMER THERMOCOUPLES TI-1-118, TI-1-119 & TI-1-120.

Checked all the three thermocouples. found TI-1-120 open. So replaced the TI-1-120 with full new assembly. now o.k. Also checked TI-1-118 & TI-1-119 thoroughly found their performance ok.

04) SECONDARY REFORMER METAL TEMP(FOUR NUMBER) CONNECTED TO TI-1-86:

All the four metal temp. points Thermocouple assemblies were removed to facilitate mechanical work. While removing found two assemblies and their cables damaged. Replace them with new units and new cables. Finally made all the four points o.k.

JOB CODE	JOB DISCRIPTION	95
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- 05) Following thermocouples were damaged, they were replaced with new units & made ok.
- a) TI-1-17.
  - b) TI-1-3
  - c) TI-1-20
  - d) Ti-1-28

- 06) Following temp. points of TI-1- were connected to TR-7 recorder as per production people demand for catalyst reduction observation.
- TI-1-11 to TI-1-16 & TI-1-108.

- 07) Following Thermowells/Thermocouple/Temp. gauge were removed to facilitate mechanical work & fixed back after completion of their work.
- a) 123 C Gas outlet
  - b) TI-1-4
  - c) 173-C ( cooling water line)
  - d) 128 JC-thermowells, pr. gauges etc.

- 08) Following temp. points were not showing correct temp. made them o.k.
- a) TI-1-6, b) TI-1-46, c) TI-1-74.

- 09) Following ISO related instruments were calibrated after general maintenance:-
- a) Receivers & set point transmitters of FRC-1, FRC-2, FIC-13, TRC-11, TRC-12, PRC-4, FRC-3, TRC-10, PRC-19, PRC-36 & PRC-9.
  - b) Receivers and set pt. transmitters of PRC-2, PRC-18 & PRC-1.
  - c) Controllers of FIC-15, FIC-13, PRC-4, PIC-5 & PRC-1a.
  - d) Transmitters of PT-4, PT-5, PT-1a & PT-28.

All other critical recorders/set points and controllers general maint. and calibration carried out.

- 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 and set the probes as per stand off gap, voltage & axial probes as per floats.

JOB CODE

JOB DISCRPTION

96

(A) 101-J:

Removed all vibration probes & temp. & pressure gauges & fixed back on getting clearance.

i) 101-JT. pt. No.1 & 2. Bearing vibration & readings was showing high. This was due to chrome plating on new shaft facing pt. no. 1 & 2 probes as per M/s Delaval Expert. To avoid doubt all the 4 probes were replaced with new probes. checked their performance, then fixed with spacer-brackets for pt. no.2 probes & pt. No.1 location was changed for that new holes/threads were made in mech. W/Shop on the opposite side of bearing casing. Total job was done in consultation with Delavel expert. After this job, vibration of both points became normal.

ii) Probe of Pt. no.8H was found damaged, replaced it with new one and adjusted gap voltage of 7.5 Volts.

iii) Vibration probe Pt. No. 3 & 7 location after fixing of new rotor was not found suitable for mounting probes. The location was shifted to bearing housing after discussion with mechanical people and M/s Delaval expert. Necessary drilling, tapping were done in Mech. W/shop and then probes were fixed.

iv) 101-J Tack-pack setting was not adjustable, so used the beacon speed indicator contact in place of Tack-pack contact.

v) 101-J Governer positioner overhauling and general maint. carried over and refixed it on the completion of mech. work.

vi) Assistance given wherever it was required for 101J revamp work by M/s Delaval expert such as for turbine over speed check, pneumatic manual regulator set provision, temporary manometer arrangements for 101-J work.

vii) Vibration point No. 10-B provided new connector at probe & at both ends of extension cable, as old connectors found damaged. Pt. No.5-H extension cable connector also changed with new connector.

viii) Turbine mech. trip limit switch was overhauled and fixed on its mounting.

ix) TA-71 thermocouple element found damaged, replaced it with new 'J' type element.

JOB CODE

JOB DISCRIPTION

97

(B) 103-J:

- i) Vibration probe pt. No.3 & 8 outer flexible conduits replaced as old were damaged.
- ii) In point No. BA extension cable replaced with new one as old was damaged.
- iii) Provided new connector to probe No. 8-H.
- iv) PRC-12 : Replaced the cylinder/positioner unit by spare calibrated unit. Its stroke/lock out relay function was checked after charging oil, found o.k.
- v) MIC-23 was removed from governor, its maint. was carried over & fixed back. Finally its stroke was checked.
- vi) Vibration probe pt. No.3,B.4.8 which were removed for mech. work, fixed back after completion of mech. work.

(C) 105-J :

- i) Vibration pt. No. 10-B new connector was provided on extension cable, towards probe side.
- ii) Probe No. 10-A & 10-B were disconnected & connected four times as per requirement of mech. people for OST - test of turbine.
- iii) PRC-9 was removed it from governor, its maint. was carried over & fixed back, finally its stroke was checked.
- iv) Removed the following vibration probes No.1,10,4,5,B,D,E & 8 to facilitate mech. work. After mech. work fixed all above probes.

(D) 102-J:

- i) Compressor/Turbine thrust pad thermocouples were opened to facilitate mech. work & fixed back after completion of their work.
- ii) Compressor bearing thermocouple Pt.No.3.31 of TR-16 one wire was broken, repaired it.
- iii) PIC-300 Transmitter impulse tapping was shifted due to modification in piping. Provided new 3/8" S.S. tubing with necessary isolation Valve.

JOB CODE

JOB DISCRIPTION

98

iv) As per MWO No.29269 dt. 9.6.97 following trips were by passed.

- a) Gov. oil header pr. low.
- b) L.O. over head tank level low.
- c) L.O. pump discharge pressure low.
- d) Turbine exhaust high pressure.

v) Vibration probes No.2,3,4,5,6,7 & 8 Axial as well as radial were removed to facilitate mech. work. After completion of mech. work Vib. probes were fixed back.

- 11) Cleaning of all vibration monitor with vaccum cleaner for 101-J, 103-J, 105-J & 102-J carried out.

Also helped Bently Nevada engineer for carrying modification in Vibration monitors of 101-J, 103-J & 105-J for making them compatible with TDM.

PGR Plant:

i) Local Sol. valve panel in field was cleaned & painted, Tighten all fittings.

ii) Following Control valves general maint. carried over & checked their performance.

KV-120.1 to KV 120.12, LCV-103, LCV-105, HCV-109, LICV-134.

iii) Following Sol. valves general maint. carried over.

SV-139, SV-141, FIC-100A, FIC-100B, LICV-185, TICV-183 & HCV-186.

iv) P/p reported that NITROGEN purging rotameter for cold box broken due to mech. work, so provided needle valve & tubing for purging.

13) AIR-DRYER:

General maint. of air dryer carried over. Non-return valves were opened overhauled & fixed back. Air receiver & Air flushing points on different floors were flushed. In addition to points provided for flushing, air was flushed through all important instruments in field before & after air filter regulators.

- 14) Air filter regulators of Ammonia C/Room, PGR-panel & NG Compressor local panel were overhauled & air headers were flushed & then fixed back.

- 15) FR-95 Pitot venturi tube was removed from line, this was flushed with air & fixed back.

JOB CODE	JOB DISCRIPTION	gg
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- 16) FIC-11 Pitot Venturi tube was removed from line as its reading were doubted by P/P. H.P./L.P. tappings were flushed with air & pen cleaning wire. Finally boxed it.
- 17) Following Latch type solenoid valves general cleaning, greasing & checking carried over.  
  
VS-1, VS-3, VS-4, VS-5, VS-7, VS-12, VS-14, VS-15, VS-150, VS-151, VS-10, VS-17, VS-18, VS-19, VS-6 & VS-102.
- 18) AR-1 (Project Work).  
  
i) Removed recorder by disconnecting all wires, laid down cable for TR-5 new location.  
  
ii) 110 V A.C. power connection was given to pre-reformer area from Oxygen Analyser junction box.
- 19) LC-13 Copper tubing lay out job completed, as it was removed to facilitate mech. work of 123-C.
- 20) 104-JT Solenoid valve was removed and fixed back three times on the request of mech. people for DST purpose. Also removed & fixed temp./pressure gauges. Also provide manual loader set for DST testing purpose & removed after mech. work completion.
- 21) I.D. Fan : Provided manual loader at I.D. Fan governor for DST checking purpose. Also provided 0-6 kg/cm2 pressure gauge on oil line.
- 22) 107-JT: Solenoid valve, temp. gauges & pressure gauges were removed on the request of mech. people. After completion of their work fixed temp. & pressure gauges. Also fixed back sol. valve. On checking found sol. valve operation was not coming. Checked all wiring continuity, local ON/OFF switch opened, cleaned its contact, also changed one flexible conduit & then checked operation found o.k.  
  
107-JT Sol. valve removed & fixed five to six time on the request of mech. people.
- 23) From LTS & HTS to Laboratory necessary 3/8" O.D. tubing with isolation valves provided & removed after completion of their work.
- 24) PT-10 (Electronic-Ix): reported showing wrong reading. On checking found one wire behind C/R open, made it ok.
- 25) V-7 Control valve sol. valve connection were removed for mech. work. After completion of mech work fixed it back & finally checked the operation of valve at Low-flow, found ok.

JOB CODE

JOB DISCRPTION

100

- 26) Reformer Pent house:  
Provided/fixed pressure gauges  
A.G. Line - 6 Nos.  
Naphtha line - 1 No. (0-25 kg/cm<sup>2</sup>)  
Steam line - 4 Nos.
- 27) 103-D Jacket water level indication was coming wrong. Cleaned the mercury switch assembly of level switch and provided lubrication. Now performance is ok.
- 28) PA-79 : 101-JC Vaccum indication was suspected by P/P. On checking found slight leakage in fitting in C/R. Made it o.k.
- 29) LR-70 Level trol general maint. carried over & leakage in output tubing inside level-trol rectified.
- 30) Removed 9 Nos. pressure gauges from pent house. Reformer pilot gas lines on the request of mech. people as the pilot lines were removed.
- 31) PA-95 in reformer pent house S.S. tubing found damaged due to mech. work. rectified it.
- 32) Sour-oil off gas control shifted near old air dryer. Cable of solenoid valve rerouted & wiring completed & checked the operation of valve. found ok.
- 33) PIC-24(440-Controller): General cleaning of the controller & air filter regulator done. Found air header partially chocked. Removed the isolation valve. cleared the chocking. Fixed back regulator & checked the performance of controller found ok.
- 34) Following 440- Controller's general maint. carried over & checked their performance.  
LC-153. FIC-7, FIC-8, FIC-9, FIC-10 & FIC-11, FIC-12 & FIC-14.
- 35) LA-106: Level switch of 103-D jacket water was leaking. Leakage is rectified by sealing it with M-Seal.
- 36) Auxiliary Boiler Burner No.1 panel was cleaned & painting job was carried out.
- 37) Due to MCC shutdown panel load was shifted from UPSS to APLAB stabiliser.
- 38) Following level trols. general maint. carried over & checked their performance, found ok.  
LC-16, LC-18 & LC-19.

JOB CODE

JOB DISCRIPTION

101

39) STEAM-DRUM INSTRUMENTS:

- i) EYE-HYE Unit general maint. carried over. Also replaced -5 electrode, as it was faulty, with new one.
- ii) LIC-1: Level-trol chamber was flushed, also air header was flushed. General maint. of level-trol regulator done & taken it in line.
- iii) PT-82: Electronic Tx checked its wiring & tighten them. General cleaning of Tx done.
- iv) PT-18: General maint. of transmitter & its regulator carried out.
- v) Steam drum low & high level alarm switches general maint. carried out.

40) C.G. Circulator:

- i) V-650 plug/seat was suspected by P/P, so removed the valve from line, production people flushed the line. After general maint. of valve, it was fixed back.
- ii) Low range Rotameter of C.G. Compressor was not working. Overhauled & fixed it back, now it is ok.
- iii) PIC-650 transmitter was replaced with spare transmitter after calibrating it for 0-10 kg/cm<sup>2</sup> range, as callibration was not coming in old transmitter.
- iv) Provided four new bulbs in Annunciator as old were fused.

- 41) Covering with PVC sheet of field instruments, where required was done.
- 42) Necessary help provided for confirmation of inst. loops & fixing temp. junction boxes, bulk head fittings etc., behind control room for project work.
- 43) Checked all annunciators in Ammonia C/Room, PGR-panel, compressor panel & N.G. Compressor local panel.
- 44) Attended all start up jobs.

PLANT TURNAROUND - MAY - JUNE 1997

AMMONIA PLANT

102

TECHNICAL & PROJECT DEPARTMENT JOBS

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

- 1) Modification of MEA distribution in 102-EA/EB for performance improvement.
- 2) Seal oil separator for 102-J / 103-JLP. Bigger size seperator replaced for performance improvement.
- 3) Replacement of N.G.Filters in Gas metering station. Replaced for better filtration of the gas.
- 4) Flow meter in A.G. to Offsite line. A.G.Flow consumption in Offsites and utility is required for submitting to FICC.

01 81 02 PROJECT JOBS :

- 1) Naphtha Process stock Preheaters have been placed in foundation in Pre-Reformer system.
- 2) Pipe fabrication and erection work for Pre-Reformer system is in progress.
- 3) Auxiliary equipment related to N.G.Booster Compressor have been placed on foundation.
- 4) Pipe fabrication and erection work for N.G.Booster Compressor is in progress.
- 5) Process Air compressor Train Revamp job at site has been completed.
- 6) Replacement of amDEA Solution for CO2 Removal System Revamp job completed.
- 7) All the existing Arch Burners of Primary Reformer (101-B) have been removed. Erection of new Arch Burners have been completed alongwith Auxiliary piping.
- 8) New BFW Heat Exchanger (123-C) has been erected. Piping and fabrication work for BFW Heat exchanger (123-C) has been completed.
- 9) Replacement of All the three critical piping loops have been completed.
- 10) All Tapping points (63 Nos) have been completed.

JOB CODE

JOB DISCRIPTION

103

- 11) All Rotary and static equipment available at site have been erected. Pipe fabrication and erection work is in progress.
- 12) Syn.Gas suction chiller has been placed on foundation.
- 13) All Civil jobs have been completed except part grating of operating platform.
- 14) Civil work for UPS System has been completed.
- 15) 11 KV MPSS. Ammonia and Urea Sub-stations have been commissioned. Major work on power cable, control cable and lighting cable including termination has been completed.
- 16) D.G.Set erection has been completed. Major cabling work has been completed. D.G.control panel has been despatched by M/s.BHEL,Bhopal.
- 17) Main cable trays have been erected. Supports for I/P converters and Transmitters have been placed at their respective locations. Calibration of all the available instruments have been completed. Cable work is started and in advanced stage of completion. Cable termination job is in progress.
- 18) DCS has been checked at site by BHEL. P/I.Converter cabinet has been erected and termination are under progress.
- 19) Preliminary work of TDM has been done.
- 20) P/I Converter cabineet has been erected and termination is completed.
- 21) Erection work in NG Boster compressor and Pre-Reformer system area has started.
- 22) UPS System erection work is in advance stage of completion.

PLANT TURNAROUND - MAY - JUNE 1997UREA PLANTMECHANICAL JOBS

104

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JOB CODE	JOB DESCRIPTION
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02 01 01 CO2 CENTRIFUGAL COMPRESSOR K-1101/1 :

Overhauling of Centrifugal Compressor was done. The following jobs were carried out.

- Foundation bolts were locked by providing additional washer.
- Coupling guard removed and coupling float measured found 3.30 mm and then compressor was decoupled.
- Top half casing of the compressor removed, rotor found in good condition.
- Bearings were removed. Cleaned and checked and found to be ok.
- Rotor was removed. Bottom casing seal condition found in good condition.
- Rotor, top and bottom half casing were cleaned. Hydrojetting of top and bottom half casing were done by D.M.Water.
- The rotor was put back in position with blue at neck ring. The rotor was not free hence, taken out and scrapping of 4 Nos of labyrinth (which were touching) were done and made it free.
- The rotor was put back in position and labyrinth clearances checked. Found within acceptable limit (See Annexure -IA)
- Centering of the rotor checked and found to be Ok (See Annexure IB)
- Top casing of compressor boxed up.
- Both end journal bearings boxed up and journal bearing clearances checked and recorded.





JOB CODE

JOB DESCRIPTION

107

- Thrust bearing boxed up and axial thrust of the rotor checked found 0.46 mm which was more than the required value. Hence old thrust shim was replaced by a new shim of thickness 6.30 mm. Axial thrust of the rotor reduced to 0.22 mm.

Before

After

Journal bearing clearances

(i) Coupling side	0.22 MM	0.22 MM
(ii) Thrust side	0.21 MM	0.21 MM
Axial thrust	0.46 MM	0.22 MM
Coupling float	3.30 MM	3.30 MM

02 01 02 CO2 CENTRIFUGAL COMPRESSOR DRIVE TURBINE Q-1101/1 :

Turbine was overhauled in presence of M/s. BHEL Engineer. The following jobs were carried out.

- Foundation bolts were locked by providing additional washer.
- Coupling float checked found 3.70 MM
- Coupling was removed and axial thrust checked. found 0.22 MM.
- Governing system lines were removed.
- L.P. & H.P. steam chest valve were removed. A washer was found in L.P. steam chest valve
- Top half casing lifted by removing casing bolts.
- Rotor was found in good condition. Seal found in good condition.
- Seal clearances were measured before lifting the rotor.
- Rotor was removed and the seal half of the bottom casing were checked and found to be O.K.
- Top & bottom half of the casing and rotor were properly cleaned.
- Rotor was put in position.
- Labyrinth clearance of the rotor checked and recorded.
- Journal bearing clearance checked and recorded (See Annexure - IIA)

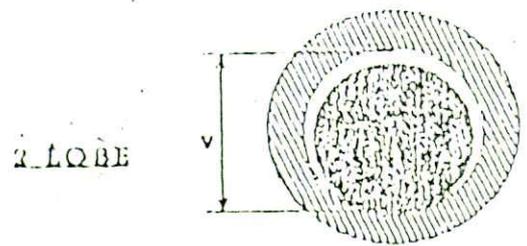
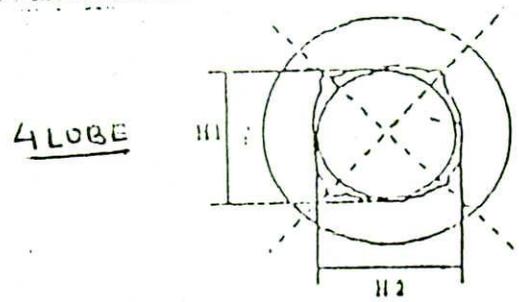
ANNEXURE: IIA

Q-1101/1

INSPECTION REPORT

STEAM TURBINE MAINTENANCE

JOURNAL BEARING CLEARANCES



1. MEASURE HORIZONTAL (H1 & H2 FOR 4-LOBE BEARINGS) & VERTICAL (V FOR TWO LOBE BEARINGS) DIMENSIONS OF BEARING SHELL INNER DIA AT BOTH THE FRONT AND REAR ENDS.
2. BEARING HALVES MUST BE CLAMPED TOGETHER FOR MEASUREMENT.

4 LOBED (Measured with Micrometer).

LOCATION	BEARING DIA						JOURNAL DIA	CLEARANCE		
	H1		H2		V			ACTUAL		DESIGN
	FRONT	REAR	FRONT	REAR	FRONT	REAR		FRONT	REAR	
FRONT	100.03		100.03				99.86	0.17	0.17	
REAR	100.05		99.97				99.86	0.19	0.11	

2 LOBE BEARINGS-Lead wire measurement.

LOCATION	N.Dia(mm)	Lead wire Diameter.	Shim thic. at P.P (A)	Lead wire thic after light.(B)	Clearance (A-B) in mm
FRONT					
REAR					

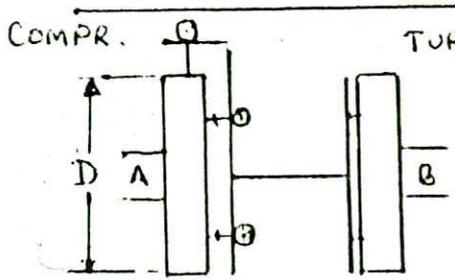
ANNEXURE: IIB

Q-1101/1

INSPECTION REPORT

STEAM TURBINE MAINTENANCE

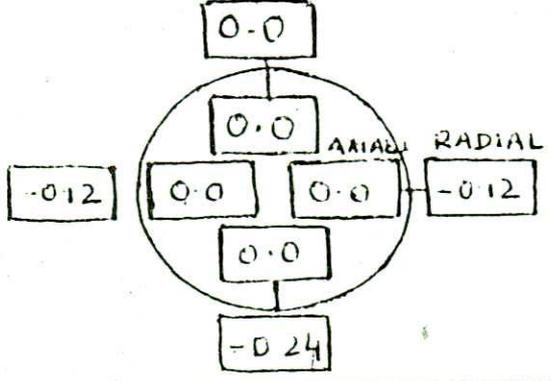
ALIGNMENT READINGS



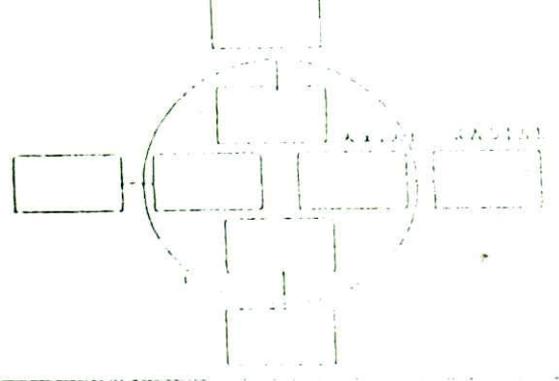
Machinery Alignment between.....

1. Checks to be made facing in the direction of steam flow.
2. Reference all radial readings to dia 300.

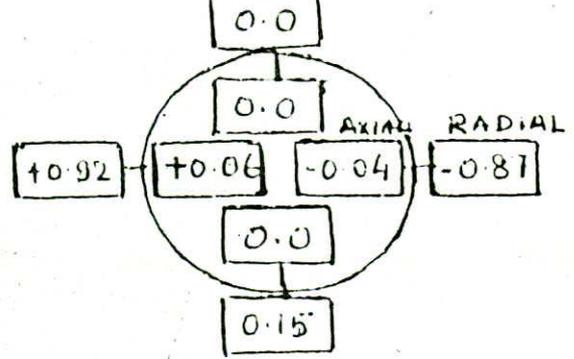
DESIGN READINGS ON 'A'



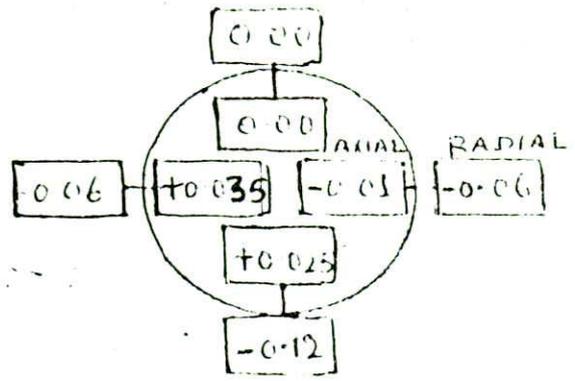
DESIGN READINGS ON 'B'



INITIAL CHECK



FINAL CHECK READING ON 'A'



READING ON A or B

JOB CODE

JOB DESCRIPTION

110

- Centering of the rotor checked and found to be O.K.
- Top half casing was assembled by applying linseed oil on the casing jointing surfaces.
- Bearings were assembled and clearances measured
- Overhauling of H.P. & L.P. relay cylinder were done by M/s. BHEL Engineer.
- Quick shut off valve, woodward governor, H.P. & L.P. relay cylinder assembly and starting device were put back in their position.
- Coupling hub was locked for OST.
- Run the oil pump. Governing oil pressure and other readings were recorded.
- By pass valve of 60 ata main isolation valve opened.
- Turbine was put on slow run (1500 rpm) for 2 1/2 hrs.
- Main isolation valve opened.
- Starting device valve was fully tightened after governor in line.
- Speed of the turbine was increased to 6700 rpm i.e. maximum governor speed by governor.
- Now the speed of the turbine was increased by using shutdown rod of the governor to 7400 rpm, but turbine did not trip. The turbine was tripped manually.
- Overspeed trip assembly of the turbine was opened, cleaned and put back in their position with a shim of thickness of 0.05 mm between locknut and guide ring.
- Again OST procedure repeated but turbine did not trip.
- Trip liver clearance adjusted and OST procedure repeated, turbine tripped at 7190 RPM.
- Compressor coupled with turbine, alignment done and reading recorded (See Annexure IIB)

02 01 03 CO2 RECIPROCATING COMPRESSOR (PB) K-1101/2 :

The following jobs were carried out.

- 3rd stage suction and discharge valves were opened and replaced by recondition valves and boxed up with new "O" rings.

JOB CODE

JOB DESCRIPTION

111

- All jack bolts of 3rd stage were replaced.
- 3rd stage head end cover opened. One no stud found sheared. D.P. test of rest studs were done and found OK. The sheared stud was replaced by new one. The head end cover boxed up with new teflon "O" ring.
- Overhauling of forcefeed lubricator done.

02 01 04 DRIVE TURBINE FOR CO2 RECIPROCATING  
COMPRESSOR Q-1101 / 2 :

Overhauling of the turbine was done in presence of M/s. BHEL Engineer. The following jobs were carried out.

- Foundation bolts were locked by providing additional washer.
- The turbine was decoupled.
- The bearings of the turbine were opened. Cleaned and checked. The rear end side journal bearing was found damaged however front end bearing was in good condition.
- Relay cylinder, quick shut off valve and chest valve were removed after removing piping.
- Top half of the casing removed and rotor was checked, found in good condition.
- Labyrinth clearances were measure and found within acceptable limit. Seal top half casing found in good condition.
- Rotor was taken out and bottom half casing labyrinths were checked and found in good condition.
- Top and bottom half of the casing and rotor were cleaned properly.
- Relay cylinder was overhauled.
- The rotor was put back in position and seal clearances were checked found within acceptable limit.
- Centricity of the rotor checked and found to be ok.  
(See Annexure - IIIA)
- Float of the rotor measured found 2.28 MM.
- Rear end journal bearing was replaced.
- Top half casing was assembled.

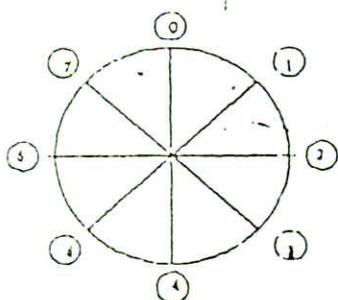
ANNEXURE: III-A

Q-1101/2

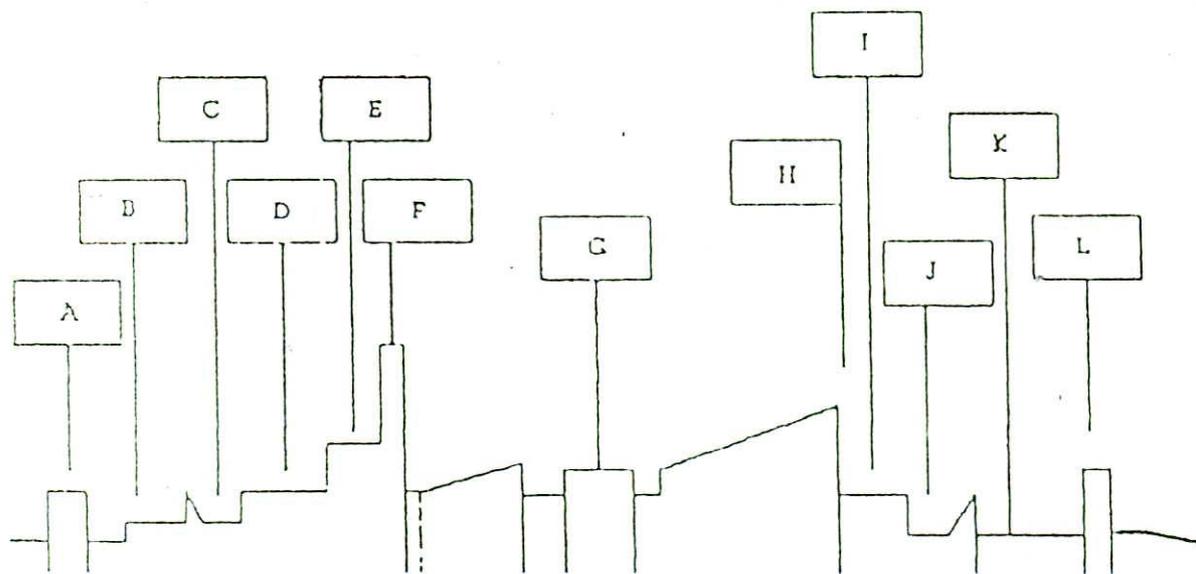
INSPECTION REPORT

STEAM TURBINE MAINTENANCE

ROTOR RUNOUTS



1. Record the runouts with thrust bearing lower half in position.
2. Runouts to be measured in vertical axis.



PORGE NO:

INDICATIONS	A	B	C	D	E	F	G	H	I	J	K	L
MAX. VALUE AT CIRCULAR PI.	0.01	0.0	0.01	0.0	-	0.01	-	0.02	0.02	0.01	0.0	0.01
INDICATIONS AS PER SKETCH												

COMMENTS:

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ANNEXURE: III B

Q-1101/2

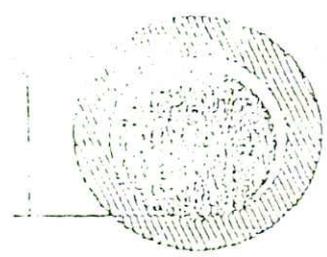
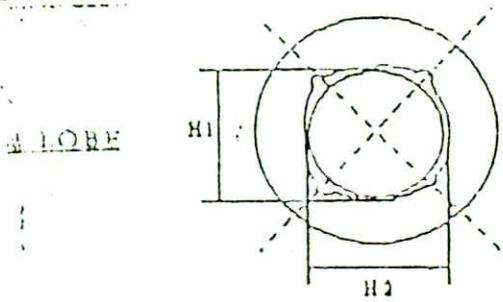
INSPECTION REPORT



FIELD USE ONLY

TURBINE MAINTENANCE

JOURNAL BEARING CLEARANCES



1. MEASURE HORIZONTAL (H1 & H2 FOR 4-LOBE BEGS) & VERTICAL (V FOR TWO LOBE BEARINGS) DIMENSIONS OF BEARING SHELL INNER DIA AT BOTH THE FRONT AND REAR ENDS.
2. BEARING HALVES MUST BE CLAMPED TOGETHER FOR MEASUREMENT.

4 LOBED/2 LOBED BEARING (Measured with Micrometer).

LOCATION	BEARING DIA						JOURNAL DIA	CLEARANCE		
	H1		H2		V			ACTUAL		DESIGN
	FRONT	REAR	FRONT	REAR	FRONT	REAR		FRONT	REAR	
FRONT	69.98		70.03				69.83	0.15/ 0.20		
REAR	80.00		80.00				79.86	0.14		

2 LOBE BEARINGS-Lead wire measurement.

LOCATION	N.Dia(mm)	Lead wire Diameter.	Shim thic. at P.P (A)	Lead wire thick. after tight.(B)	Clearance (A-B) in mm
FRONT					
REAR					

REMARKS:

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- The bearings were assembled. The journal bearing clearances were checked and recorded (See Annexure - IIIB)
- Steam chest valve assembly, relay cylinder and quick shut off valves were assembled.
- Overhauled emergency governor, starting device and hand cut out and put back in their position.
- Overspeed trip test done. The turbine was tripped at 9700 RPM.
- Turbine coupled with gear box.

02 02 01 AMMONIA PUMP P-1102 B :

Following jobs were carried out as preventive maintenance.

- Suction and discharge valves opened, cleaned, checked and found to be ok. Suction and discharge valve boxed up with new "O" ring.
- Crank case and gear box oil flushed.
- Coupling cleaned and boxed up.

02 02 02 CARBAMATE PUMP P-1201/B :

The Carbamate pump was overhauled as a preventive measure. The following job were carried out.

- Crank case oil of the pump drained and pump was decoupled.
- Crank case cover opened and thrust was measured, found 1.70 MM which was more than the required valve . Hence top half of the thrust bearing opened and checked. Thrust bearing found damage.
- Clearance between cross head and cross head shoe checked and found to be ok.
- All plunger were removed.
- Journal bearing clearance at big end bearing checked found ...

Ist	:	0.15 MM to 0.18 MM
IIInd	:	0.14 MM to 0.16 MM
IIIrd	:	0.12 MM to 0.14 MM

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 JOB CODE                      JOB DESCRIPTION  
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- Journal bearing clearance of main bearing checked and found ...

Ist        :    0.22 MM to 0.24 MM  
 IInd      :    0.22 MM to 0.25 MM  
 IIIrd     :    0.20 MM to 0.15 MM  
 IVth      :    0.20 MM to 0.25 MM

- Main bearing were assembled after cleaning.
- Damaged thrust bearing was replaced by new one.
- Thrust of the crank shaft assembly was measured and found 0.32 MM
- Cross head assembly were boxed up.
- 3rd plunger was replaced by new one.
- Barrels were assembled with new packing.
- Alignment of the plunger done and clearance between cross head and cross head shoe checked and found to be ok.
- Crank case cover boxed up.
- Suction and disch. manifold valves were opened and boxed up with new "O" rings.
- NRV's of ammonical water line were replaced by new one.

GEAR BOX OF P-1201 (CARBAMATE PUMP ):

Following jobs were carried out.

- Both the bearings of the Gear box were opened and cleaned.
- Journal bearings clearance checked and found 0.15 MM for both bearings and boxed up.
- Gear box oil flushed and coupled with turbine and pump.
- Oil pump run, no leakage observed.

02 03 01 PRILL TOWER I.D.FAN (K-1401/1 TO 4 ) :

Following jobs were carried out.

- Cleaned fan blades.

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- Removed bearings cover, checked the condition of the bearing and boxed up with fresh grease.
- Alignment of fan with motor checked / rectified wherever required.

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

- Bearing of inlet air fan (K-1701) opened, cleaned, checked and found to be ok and finally boxed up.
- Cloth belows of K-1702 were replaced.
- Bearing of K-1702 opened, cleaned, checked and found to be ok and then finally boxed up.

02 13 01 HYDROJET CLEANING OF HEAT EXCHANGER :

The following heat exchangers were opened, hydrojet cleaning done and then boxed up.

- (1) Surface Condenser (H-1114)
- (2) Main lube oil cooler (H-1113 A/B)
- (3) Flash tank condenser (H-1421)
- (4) I Evaporator (H-1422)
- (5) I Evaporator condenser (H-1423)
- (6) II Evaporator I Condenser (H-1425)
- (7) II Evaporator II Condenser (H-1426)
- (8) Recirculation Heater (H-1204)
- (9) Lube oil coolers of P-1102 A/B & P-1201 A/B
- (10) CCS II Cooler (H-1207)
- (11) Urea solution heater (H-1422/A)

02 13 02 CHEMICAL CLEANING OF H.P. STRIPPER H-1201 :

The scaling in the Stripper tubes has been measured by M/s.Stamicarbon in Oct,1993 plant turnaround by using caliber probe. The Scaling thickness appeared to be 8 mm. Chemical cleaning was advised by M/s.Stamicarbon to increase heat transfer and efficiency of the Stripper.

PRE-SHUTDOWN ACTIVITY :

- (1) Fabrication of chemical mixing tank - A chemical mixing cum dozzing tank of size (7 M x 2 M x 1.5 M) of C.S. was fabricated. Visual inspection and leak test of the tank were done by inspection department and found to be ok.
- (2) A Stripper top dummy plate, flanges for nozzle C1,C2,and C3 of Stripper and a flange for nozzle C1 of V-1502 were fabricated in workshop.

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- (3) All piping work was completed as per drg.No.02-BL-13390 (HP Stripper (H-1201) chemical cleaning arrangement) except end connection of 23 ata steam line, Chemical Solution inlet and nitrogen inlet line connection to H.P.Stripper and chemical off gas line connection.

AFTER SHUTDOWN :

- Top cover of the Stripper removed.
- All tack welds between false tube sheet and ferrules were ground.
- False sheet and ferrules were removed.
- Random thickness measurement of tubes were carried out by inspection section.
- Visual inspection by M/s.Houseman was done.
- HICV-1201 was removed from its position and a blind is provided in liquid inlet nozzle.
- CO2 inlet line and carbamate Soln outlet line were removed.
- Chemical solution inlet line and nitrogen inlet line were connected to nozzle C2 & C3 of Stripper respectively.
- Stripper top cover boxed up with dummy plate and gasket.
- Rest of the end connetion job were completed as per the drg.No.02-BL-13390.
- A check valve (2" x 150 # ) was provided in between level indicator and flow meter in the nitrogen line.

CHEMICAL CLEANING PROCEDURE :

Quantity of chemical based on

Average scale thickness	:	2 MM
Density of the scale	:	4 Kg/l
No.of tubes to be cleaned	:	2179
Inside dia of the tubes	:	25 MM
Length of the tube	:	6000 MM

JOB CODE                      JOB DESCRIPTION

- Chemical & other service used
- EDTA-H4 Free Acid C10H16N2O8
- Hydrazine
- Sodium Carbonate
- Sodium metasilicate
- Inhibitor Radine - 31
- Nitrogen at 10 bar
- D.M. Water
- Cooling water

PROCEDURE :

- (1) All new fabricated lines were flushed with condensate after air blowing.
- (2) Degreasing of tubes :- Heavy duty non-caustic detergent Sol was prepared in chemical mixing tank and filled it to HP Stripper. Circulation of detergent Sol was done by nitrogen at temp. 70 deg. to 80 Deg.C and atm pressure for 8 hrs.
- (3) Detergent Sol was drained and stripper was washed by using DM water.

CHEMICAL CLEANING :

- Chemical Soln was prepared in chemical mixing tank and filled it to HP stripper by P-1426 up to the level marked on level indicator.
- The nitrogen gas was supplied for bubbling through the liquid caused agitation and an internal circulation and was continuously vented to atmosphere. The temperature 145 to 160 deg.C at pressure 5 Kg/cm2 inside the Stripper was being maintained by using L.P.steam in shell side and vent valve at stripper top respectively.
- During the chemical process samples were taken from sample point for determination of ...  
Iron content.  
Free EDTA  
PH Valve
- After completion of each batch, the pressure and temperature were lowered and liquid were drained off to strong effluent pit.

JOB CODE

JOB DESCRIPTION

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No. of batch of chemical cleaning - 4 batch

After completion of chemical cleaning bottom cover of H.P.Stripper opened handed over to M/s.Stamicarbon for inspection. The observation made by M/s.Stamicarbon can be seen from inspection report by M/s.Stamicarbon.

REPAIR WORK IN H.P.STRIPPER :

- Tube to tubesheet welding of tube No.8,42,120,152,304, 419,430,540,665,794, & 919 were repaired by using 25.22.2 LMn filler wire.
- Liquid impingement plate was replaced by new one.

After completion of repair work the modified ferrules were put in position with new teflon gasket. Tack welding of ferrules with false tube sheet were done. The bottom cover was being boxed up as a parrallel activity. Precaution was taken to avoid entrance of any foreign particle inside the stipper. The stipper was handed over to production deptt. for 4P measurement. Top cover of the stripper was boxed up with new gasket after getting clearance from production deptt.

- HICV - 1201 boxed up.
- CO2 inlet line and urea soln outlet line boxed up.
- Steam tracing line rewelded.

H.P.Stripper finally handed over to production deptt.

02 13 03 H.P.SCRUBBER (H-1203) :

- Tube bundle of H.P.Scrubber damaged while it was being lower down for inspection.
- Damaged tube bundle was replaced by new tube bundle procured from M/s.L & T, Powai Bombay.

02 13 04 RECIRCULATION HEATER (H-1204 ) :

- Hydrojet cleaning of the heater done.
- Orific plug provide at the bottom of the tubes.

02 13 05 AUTOCLAVE (V-1201 ) :

Existing trays overflow line and funnel were replaced by M/s.L & T under supervision of M/s.Scholler Blakmann. An additional tray was also provided with new tray support brackets.

JOB CODE

JOB DESCRIPTION

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BRIEF INFORMATION ABOUT EXISTING REACTOR & TRAYS

ID of Reator	:	2650 MM
Distance between TL to TL of Reactor	:	26200 MM
Height from support structure of Reactor to Top TL	:	22650 MM
Height from top TL of Reactor to face of manhole.	:	1950 MM
ID of the manhole	:	800 MM
Distance between bottom most tray & bottom TL of the Reactor.	:	2550 MM
Distance from top tray to top of funnel.	:	500 MM
Total Nos of trays	:	10 Nos
Diameter of tray	:	2630 MM
Clearance between tray OD & Reactor Shell liner I.D.	:	10 MM
Pitch of trays	:	2350 MM
Nos.of section per tray	:	04 Nos
Width of the tray section	:	658 MM Max.
Length of the tray section	:	2630 MM Max.
Approx weight per tray	:	455 Kg.
Approx.weight of tray section	:	150 Kg.Max.
Type of fixing arrangement of trays	:	By bolting to the bracket.
Nos.of bracket with bolt (size 1/2"UNC): for tray fixing per tray.	:	14 Nos
Nos.of bolt (size 1/2" UNC) for joining: of tray section per tray.	:	38 Nos
Size of overflow line	:	8"
Size of funnel	:	700 OD x 400 Height

JOB CODE

JOB DESCRIPTION

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BRIEF DESCRIPTION ABOUT NEW REACTOR TRAYS AND OVERFLOW LINE

Total Nos. of trays	:	11 Nos
Diameter of trays	:	2644 MM
Clearance between tray OD & reactor shell I.D.	:	3 MM
Pitch of trays	:	2350 MM
No. of section per tray	:	04 Nos.
Width of the tray section	:	661 MM Max.
Length of the tray section	:	2644 MM Max.
Approx Wt. per tray	:	590 Kg.
Approx Wt. of tray section	:	180 Kg. Max.
Type of fixing arrangement of trays.	:	By bolting to the bracket.
Nos. of Bracket with bolt (size M-12) for tray fixing per tray.	:	15 Nos
Nos. of bolt (size M-12) for joining of tray section per tray.	:	48 Nos
Size of overflow line	:	10"
Size of funnel	:	1000 OD x 485 Hiehggt

INSERT LINER SEGMENT REPLACEMENT IN REACTOR :

As per the inspection report by M/s. Stamicarbon the insert liner of compartment No.3 shows high corrosion. The minimum thickness reduced to 3.4 MM. The minimum allowable thickness is 3.0 MM. Hence the insert liner was replaced.

REPLACEMENT PROCEDURE :

- 1) Old insert liner segment removed by grinding the insert liner welding without any damage to loose liner / back up strip.
- 2) Old weld materials removed from shell liner.
- 3) Bevelling of shell liner end face done.
- 4) DPT of bevelled face done.

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- 5) Ferite and ultrasonic thickness measurement of loose liner segments done.
- 6) Damaged surface of loose liner was repaired using thermentit 19/15 H filler wire.
- 7) The profile of required insert liner was taken and a templete for the correct size of new insert liner was made.
- 8) Applied air at 0.2 Kg/cm2 from the nearest weep hole for confirming the air leakage through the annualr space between shell and liner segments at the areas of loose liner. The other weep holes were plugged during the test.
- 9) The new insert liner was fabricated as per required dimension and curvature of 2 RE 69 material.
- 10) DPT & ferrite check of new inert liner done and found to be Ok.
- 11) The insert liner was installed and tack welded with shell liner.
- 12) The root run completed by TIG welding using 25-22-2 LMn filler wire keeping low heat input.
- 13) DPT & ferrite check of root run done.
- 14) Remaining weld pass completed by using 25-22-2 LMn filler wire.
- 15) DPT & ferrite check of final run done and found to be Ok.
- 16) Air and soap solution test at 0.2 Kg/cm2 done.
- 17) The new weld cleaned & then passivated by washing with 4% HNO3 and rinse with plenty of DM water.

02 14 01      STEAM LEAK JOBS :

Steam leak job done as per production list.  
Material consumed.

Gate Valve 1/2" x 800 #	:	10 Nos
Gate Valve 3/4" x 800 #	:	09 Nos
Gate Valve 1" x 800 #	:	05 Nos
Gate Valve 1 1/2" x 800#	:	01 No
Gate Valve 2" x 800#	:	01 No
C.S.pipe 1/2" NB	:	30 Mtr.
C.S.pipe 3/4" NB	:	10 Mtr.
C.s.pipe 2" NB Sch.40	:	18 Inch
3/8" dia Tube	:	05 Mtr.

JOB CODE

JOB DESCRIPTION

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02 17 01 INSPECTION / REPAIR OF CHECK VALVE :

- (1) CO2 TO H-1201
- (2) NH3 TO H-1202
- (3) NH3 TO V-1201
- (4) CARBAMATE TO H-1202
- (5) CARBAMATE TO H-1203
- (6) CO2 TO H-1203
- (7) 4 ATA STEAM TO V-1301
- (8) P-1204 A/B DISCHARGE
- (9) P-1202 A/B DISCHARGE
- (10) P-1501 & P-1506 DISCHARGE
- (11) 23 ATA STEAM TO V-1351

02 17 02 RELIEF VALVE TESTING JOBS :

Following Relief valves were tested on test bench.

Relief Valve	Set pressure
RV-1201 A/B/C (Off gas line V-1201)	161 Kg/cm <sup>2</sup>
RV-1202 A/B/C (Gas outlet of V-1202)	6 Kg/cm <sup>2</sup>
RV-1128 (On exhaust of Q-1101/2)	26 Kg/cm <sup>2</sup>
RV-1130 (23 ata steam header)	26 Kg/cm <sup>2</sup>

02 17 03 OVERHAULING OF ROTARY & ISOLATION VALVE :

- (1) Rotary valve M-1701 1/2 & 3
- (2) Isolation valve of Ammonia pump (P-1102 A/B)
- (3) Isolation valve of Carbamate pump (P-1201 A/B)
- (4) Isolation valve of P.B.Compressor's turbine  
(Q-1101/2)

02 18 01 CLEANING / SERVICING OF LEVEL GAUGES :

Cleaning / servicing of the following level gauges done.

- (1) 4 Ata steam drum , 2 Nos (V-1501)
- (2) 23 Ata steam Saturator (V-1502)
- (3) 9 Ata Steam saturator (V-1503)
- (4) Rectifying column (V-1202)
- (5) II Desorber (V-1301)
- (6) I Evaporator Separator (V-1423)

## UREA PLANT

## INSPECTION JOBS

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 JOB CODE      JOB DESCRIPTION
 

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02 41 01    AUTOCLAVE V-1201 :

During this shutdown, installation of modified tray assemblies and fixing of one additional tray segments below 10th tray had been planned. The new modified tray assembly alongwith clips were supplied by M/s.Scholler blackman,Germany. Removal of old tray segments and the installation of new modified tray segments were done by M/s.L&T, Mumbai under the supervision of M/s.Scholler blackman Engineers. Inspection of Autoclave internal was carried out jointly by IFFCO Inspection Engineers and STamicarbon Engineers before removal of old tray segments. Following observations were made on visual inspection and other NDT inspection like Ultrasonic thickness measurement, Ferrite measurement etc.

OBSERVATIONS ON VISUAL INSPECTION :

In general, the corrosion on shell liner was low and mostly the liner surface was very smooth with exception on the insert liner. The liner welds show marginally higher corrosion starting rough in the top to smooth in bottom. The surface of insert liner provided on shell liner of 3rd,4th,8th,9th and 10th compartment liner seems to be roughened and showed some corrosion and also their behaviour is definitely different than the shell liner plates. The wall thickness readings indicate thickness reduction on the insert plates and a higher corrosion rate compared to the shell liner. Min thickness of 3.3 MM. was observed on the insert liner of 3rd compartment. The min.allowable thickness is 3.0 MM. At most of the locations, the tray support clips were in bad condition, as most of them showed severe corrosion and cross cut end attack. Some of the old clips were marked for replacement during this turnaround due to severe corrosion and thinning, however M/s.Stamicarbon Engineers had advised to replace all the old tray clips with new modified J-bolts during next turnaround.

ULTRASONIC THICKNESS MEASUREMENT :

The thickness of the liner was checked with a Panametrics Thickness Tester Model-5230B. The accuracy of measurement is + / - 0.1 mm.

TOP SECTION (COMPARTMENT - 1 ) :

Min.thickness : 5.0 MM  
 Max.thickness : 5.4 MM  
 Avg.thickness : 5.2 MM

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MIDDLE SECTION (COMPARTMENT - 5 ) :

Min.thickness : 5.1 MM  
Max.thickness : 5.7 MM  
Avg.thickness : 5.5 MM

BOTTOM SECTION (COMPARTMENT - 9 ) :

Min.thickness : 5.0 MM  
Max.thickness : 5.2 MM  
Avg.thickness : 5.2 MM

BOTTOM HEMISPHERICAL DISHED END :

CROWN PLATES:

Min.thickness : 6.4 MM  
Max.thickness : 6.9 MM  
Avg.thickness : 6.65 MM

EAST SIDE COVER PLATE PROVIDED BETWEEN TWO CROWN PLATES

Min.thickness : 6.4 MM  
Max.thickness : 6.8 MM  
Avg.thickness : 6.6 MM

WEST SIDE COVER PLATE PROVIDED BETWEEN TWO CROWN PLATES

Min.thickness : 5.0 MM  
Max.thickness : 5.4 MM  
Avg.thickness : 5.2 MM

TOP COMPARTMENT :

On top compartment (Top Hemi-End) next to the sealing surface, some condensation corrosion was noticed so insulation around the cover should be improved. The liquid level was at the tangent line and on the liquid, grey brown deposits were noticed and it was confirmed to be oxidized oil. This was required to be removed to avoid active corrosion beyond the deposit. Scaling was noticed above the tangent line and the scaling thickness was about 1.0 MM. In the top dome, the min. wall thickness was 3.7 MM and the average wall thickness was 4.3 MM and it was observed that the corrosion rate in the top dome is higher than the liquid level (Average thickness of liner is 5.2 MM in liquid level portion ) Therefore, in future, repair might be expected in the top dome.

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BOTTOM HEMISPHERICAL DISHED END :

On the bottom hemispherical dished end the liner as well as the welds showed normal corrosion. The liner plates of the bottom dished end had been replaced during Nov-93 plant turnaround. The petal plate butt welding with backing strip seems to be of joggled type and the welding surface protruded out from the liner plate surface and this location may susceptible for stress induced intergranular cracks and needed to be inspected by DPT.DP test was carried out on these locations/weld joints of the bottom dished end and no defects were found. In this compartment, the shell liner longitudinal weld (est side) was marked at two locations for pinhole repair. Similarly, two spots on East side of Ammonia nozzle weld, one spot on the gas inlet (from HPCC) nozzle were marked for pinhole repair.

INSPECTION ON NEW TRAY SEGMENTS INSTALLATION :

After the removal of all the tray segments, the installation of new modified trays was started from bottom of the reactor. New tray clit weldings have been checked by Dye Penetrant Test and similarly, all the repair weld on old clits were also inspected by DPT. DPT was jointly witnessed by IFFCO and M/S. Scholler Blackman Engineers. After completion of the tray installation, visual inspection of Autoclave internals was done and joint inspection report was prepared (see Annexure-1). All the new tray clits and its weldings have been inspected for the presence of ferrite and found nil ferrite.

REPLACEMENT OF INSERT LINER IN THE THIRD COMPARTMENT OF AUTOCLAVE:

Insert plate provided on the circumferential weld of shell liner between 2nd and 3rd tray segments of Autoclave(see Fig.-1 for details) had indicated severe corrosion and roughened surface as compared to shell liner. Minimum thickness of 3.3mm was noticed on this particular insert liner and the minimum allowable thickness is 3.0mm only as per M/S Stamicarbon. In view of this, it was decided to replace the corroded insert liner with new 6.0mm thick Stainless Steel plate of 2RE-69 grade material. ( i.e.25-22-2 urea grade S.S.).

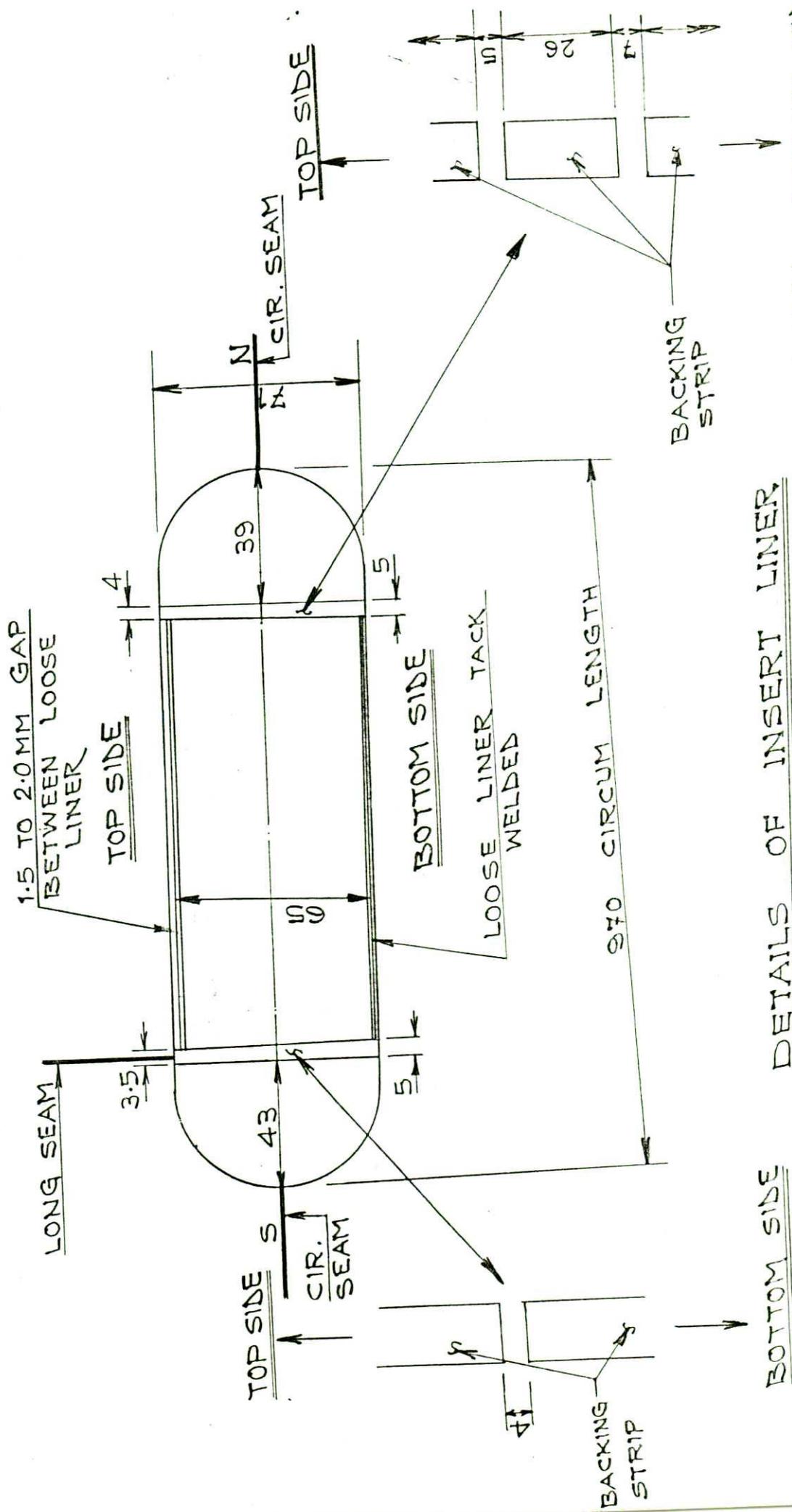
Following are the activities and inspection carried out during replacement of insert liner:

1. Removed the old insert liner by grinding the insert liner welding without damaging the loose liner/Back up strip plate kept behind the insert liner(see Fig.-2 for details)



DATE: 30/05/197

FIGURE: 2



DETAILS OF INSERT LINER  
BELOW 2ND TRAY SHELL LINER V-1201

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2. After removal of the corroded insert liner, the old weld metal deposit from shell liner face was removed carefully by smooth grinding.
3. Prepared the bevelling of shell liner end face by grinding.
4. Bevelled face was inspected by DPT.
5. Ferrite check and Ultrasonic thickness measurement of loose liner segments were done. Ferrite was found to be nil. Thickness of the loose liner was found to be 3.0mm.
6. New S.S. plate of 6.0 mm thickness (25-22-2 urea grade) was cut to the required profile. Plate was inspected for DPT and ferrite check and found to be defect free and containing nil ferrite.
7. Root run welding was carried out by TIG welding using 25-22-2LMn filler wire. Air connection from the weep holes and air pressure in the annular space was completely removed before welding.
8. DPT and ferrite checks were carried out on root run welding and found satisfactory.
9. Remaining welding was also carried out using 25-22-2 L Mn filler wire. During welding, interpass temperature was maintained below 150 degree C.
10. DPT and ferrite check were carried out on final welding and found satisfactory.
11. Air and soap solution test at 0.2 kg/sq.cm. pressure was carried out for new insert liner and its welding. No leakage was found during the test.
12. Finally new weld was cleaned and passivated by washing with 4 percent HNO<sub>3</sub> and rinsed with plenty of DM water.

02 41 02 HP STRIPPER-H-1201 :

Visual inspection of the Stripper top dome, bottom dome was carried out alongwith Stamicarbon engineers. The following other inspection activities were carried out.

- (A) Thickness measurement of weld overlay in the top dome of the HP stripper was carried out before and after chemical cleaning. The following readings were recorded.

1. Manway	:	11.63 to 13.27 MM
2. Top Dome (Gas phase)	:	11.31 to 11.86 MM
3. Top Dome (Liquid phase)	:	10.56 to 13.16 MM
4. Other circumference of tubesheet	:	07.83 to 09.16 MM

JOB CODE      JOB DESCRIPTION

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After chemical cleaning, one more set of readings was taken to evaluate any loss of metal thickness. The readings were recorded as follows:-

1. Manway : 12.19 to 13.36 MM
2. Top Dome (Gas phase) : 8.83 to 12.36 MM
3. Top Dome (liquid phase): 9.32 to 13.66 MM

Top Dome in liquid phase at approx. 9" above the tubesheet where max. roughening of the overlay surface was observed after chemical cleaning : 7.96 to 10.58 MM

4. Outer cir. of tubesheet : 7.96 to 10.19 MM

Minimum thickness of weld overlay was found to be 7.83 mm on tubesheet against the design thickness of 8.00 MM. Major amount of bluish thick oxide scales which were present before chemical cleaning was found cleaned off after chemical cleaning.

- (B) Visual inspection of the tube inside surface was carried out with the help of industrial fiberscope which was hired from KRIBHCO. A bluish and blackish layer of oxide scaling was observed inside the tubes upto 4 meters from top. Beyond 4 meters, bright lustre of metal surface was visible. The scale was observed to be uniformly adhered to the tube surface. No lumps of scale or abrupt scaling in any of the tubes inspected were seen. After chemical cleaning same tubes which were inspected before were inspected to evaluate the effect of chemical cleaning. It was observed that the bluish oxide layer was absent in most of the tubes. A few tubes could be identified which had minor brownish stringers of scales.
- (C) Approximately 300 tubes located in different areas on the tubesheet were scanned for inside diameter measurement upto 12 inch depth from top using Bore Hole Gauge. Min. ID was measured to be 25.50 mm and max. ID was 26.15 mm against design ID of 25 mm. Similar exercise was carried out on the same tubes after chemical cleaning to verify any possible loss of tube metal but no appreciable loss in wall thickness was found. The ID measurements showed the similar results as found before chemical cleaning i.e. 25.55 mm (Min) & 26.15 mm (Max) ID.

The top plate and bottom plate of the liquid inlet box welded to the dome and tubesheet were found corroded and became thin. The welding of the same with the tubesheet had also got eaten away. This was repaired by workshop group using new plate. The weld joint was DP tested and found ok. Ferrite in the weld metal and parent metal was found 'nil'.

JOB CODE

JOB DESCRIPTION

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(D) M/s Stamicarbon engineers performed the following jobs on HP Stripper.

1. Visual inspection of top and bottom domes, tubesheet etc.
2. Thickness measurement of S10 tubes in top 3 meter length using Eddy current testing instrument.
3. Thickness measurement of overlay welds in top and bottom dome.
4. Evaluation of tubesheet C.S. portion beneath the tubes using ECT probe. A void in the C.S. portion of the top tubesheet surrounding the tube No. 1712, 1669, 1713 and 1670 was detected. No voids were detected in the bottom tubesheet.

02 41 03 HP CONDENSER H-1202

1. The top and bottom domes of the HP condenser were opened. Visual inspection revealed that the condition of the liner plates, tube to tubesheet welds was good. No signs of abnormality could be noticed. During visual inspection, a few defects were marked due to undercuts, pinholes for repairs. After grinding, DP test was done. The defects were rectified by welding followed by DP test and Ferrite measurement. No ferrite could be detected in the repair welds.
2. The engineers of M/s Stamicarbon also carried out the following examinations.
  - a) Visual inspection of top cover, top channel, bottom channel and bottom cover, tubesheets etc.
  - b) Tubesheet examination to detect voids. No voids could be detected.
  - c) 225 Nos. of tubes were measured for wall thickness over the entire length. The wall thickness was found to be 2.40 mm (Min) and 2.55 mm (Max). Average wall thickness was calculated as 2.48 mm.
  - d) Liner thickness measurement was carried out. Min. thickness was found to be 6.8 mm in top section and 6.4 mm in the bottom section.

The detailed report on inspection was submitted by Stamicarbon experts indicating their findings and recommendations.

JOB CODE

JOB DESCRIPTION

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02 41 04 HP SCRUBBER - H 1203:

During lowering of the tube bundle, an accident took place and the complete tube bundle fell down to ground floor from its elevation resulting in heavy damage to the tubes & baffles, channel cover etc. In order to assess the extent of damage to the main shell liner, thorough visual inspection, thickness measurement and air and soap solution tests were performed on the main shell liner. The details of inspection carried out are given below:-

(A) MAIN SHELL :

(a) Visual inspection of the main shell liner was done alongwith the Stamicarbon engineers. The following observations were made:-

1. The liner surface was found with shallow scratches due to rubbing of the baffle plates while lowering of the tube bundle.
2. The weld joints were found to be smooth and free from any corrosion attack.
3. The weld joints of the liquid overflow basket were free from corrosion.

(b) DP test of the basket welds and pipe support clit fillet welds was carried out. A crack was observed at the edge of the fillet weld of the clit pad to the liner. The defective length of the fillet weld was ground off followed by DP test and it disappeared after approx. 3 mm deep grinding. This was repaired by TIG welding using Thermanit 19-15 H filler wire. After welding, DP test was carried out. No defect was observed. Ferrite in the weld metal was found to be 'nil'. The annular space was then pressurised with air at 3 PSI and soap solution was applied on the repaired weld joint as well as on all the longitudinal & vertical seams of the liner as well as basket welds. No leakage could be detected under air and soap solution test.

(c) Ultrasonic thickness measurement of the shell liner was carried out. Thickness of the liner was found 5.1 mm (Min.) and 5.6 mm (Max.)

JOB CODE

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**(B) UPPER SHELL:**

(a) Visual inspection of the internals was carried out alongwith STAC engineers. The followings were the observations.

1. The overall condition of the liner welds was satisfactory. The welds joints were smooth and free from any corrosion attack.
2. The central pipe was found buckled which was noticed during previous inspection also.
3. Minor corrosion was observed on the weld joint of the pipe supporting ring fillet weld with the liner.

(b) Ultrasonic thickness measurement of the upper shell liner was carried out. Min. thickness was recorded as 4.8 mm and max. 5.3 mm.

**(C) TUBE BUNDLE:**

Since the existing tube bundle was damaged it was replaced by new bundle fabricated by M/s L&T. Mumbai, using new tubes, tie rods, funnel pipe assembly, baffle plates and dishend etc., but with the old tube sheet and Channel cover flange assembly.

**02 41 05 OTHER VESSELS:****1. 4 ATA STEAM DRUM, V-1501.**

Visual inspection and ultrasonic thickness measurement were carried out from inside. The following observations were made.

- a) The shell had assumed blackish colouration.
- b) The demister pads were intact in position and their condition was satisfactory.
- c) The riser baffle plates were intact in position. However, some bolts of riser plates on west side were found missing as well as loose which were marked for rectification.
- d) Shallow pittings were observed on the dished end.
- e) One No. bolt of flange point of the distributor pipe (at south side) was missing.
- f) Ultrasonic thickness measurement was carried out on shell and dished ends. The report is attached herewith at Annexure-2.

JOB CODE      JOB DESCRIPTION

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2. 23 ATA STEAM DRUM V-1502:

Visual inspection, ultrasonic thickness measurement and magnetic particles inspection on the weld joints was carried out.

a) The observations made during visual examination are given below.

1. The shell inside surface was found blackish in coloration.
2. The overall condition of the weldjoints of shell and dished ends was found satisfactory. Underflush grinding was observed at the edge of the beads which was observed in the past also and it is since manufacturing stage.
3. The dished ends were found to have scattered shallow pittings and millscales which appear to be since manufacturing stage.

b) Magnetic particle testing of all the weldjoints was carried out. Defect was observed on the west side manhole nozzle to dished end weld joint which was marked for repairs. No other defects were observed in MPI.

c) Ultrasonic flaw detection was carried out on the manway nozzle (west side and east side) to dished end weld joint. No significant defect was observed on the east side manhole nozzle whereas lack of fusion type defect was observed on the west side manhole nozzle to dished end weld which was also confirmed during MPI. DP test was also performed. The defective area of the nozzle was traced out for repairs.

d) Ultrasonic thickness measurement was carried out. The report is attached herewith at Annexure -3. Minimum thickness on shell was observed to be 30.3 MM against design thickness of 30.0 MM. On dished end, min. thickness was measured to be 36.0 MM against design thickness of 37.0 MM. Detailed report is attached herewith.

JOB CODE

JOB DESCRIPTION

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REPAIRS.

The nozzle weld point was repaired on the complete circumference by grinding it approximately 15 MM. Necessary preheating and post weld heat treatment were carried out. After repairs, DP test & MPI of the repaired weld was carried out and no defect was observed. After completion of the postweld heat treatment, hardness was also measured. On parent metal, Hardness was found to be 158 BHN which are the normal values for the A-515 Gr 55 material.

The detailed procedure followed for the repair work is enclosed herewith at Annexure-4.

3) 1ST STAGE DISCHARGE SEPARATOR : V-1111.

The vessel was offered for inspection after removing the top dished end. Internal inspection was carried out and the following observations were made.

1. The colouration of the demister pad was brownish black.
2. The demister pad segments were intact in position and no damages were seen.
3. Ultrasonic thickness measurement was carried out. Min. thickness on shell was found to be 5.0 MM against the design thickness: 5 MM . Also, on dished end, min. thickness was found to be 7.3 MM (Top dished end) and 7.9 mm (bottom dished end) . Design thickness of 8.0 MM. The detailed report is attached at Annexure-5.

4) IIInd STAGE DISCHARGE SEPARATOR, V-1112:

After removal of the top dished end, the vessel was offered for inspection. The following observations were made;

- a) The demister pads were found Reddish, white in colouration.
- b) Two Nos. demister pads fastening bolts were found sheared off and two bolts were found loose. These needed rectification and replacement.
- c) Ultrasonic thickness measurement was carried out. Min. thickness was observed to be 11.0 MM on shell against design thickness of 10.0 MM. The top dished end was found to have 10.1 MM min. thickness whereas bottom dished end was found to have min. thickness of 10.5 MM against design thickness of 10.0 MM. The report is attached herewith at Annexure-6.

JOB CODE      JOB DESCRIPTION

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5) LP ABSORBER V-1203:

The vessel was inspected from top and bottom after opening both the manholes. The following observations were made:

- a) Blackish brown colouration was observed on top and bottom shell internal surface.
- b) Grills covering the rings were intact in position.
- c) Condition of the weld joints was found to be satisfactory as no apparent effect of corrosion could be noticed during visual inspection.
- d) Ultrasonic thickness measurement was carried out. Min. thickness of shell was found to be 6.3 mm (design 6 mm) and dished end thickness was found to be 8.7 mm (Min) against 8.0 MM design thickness. Detailed report is attached herewith at Annexure-7.

6) L.P. VENT SCRUBBER V-1206:

Visual inspection and ultrasonic thickness measurement were carried out. The following observations were made.

- a) The condition of demister pads was found satisfactory.
- b) The sieve covering the catalyst bed was found satisfactory.
- c) All the fastening bolts of the catalyst covering sieve were intact in position.
- d) Ultrasonic thickness measurement was carried out. Min. thickness was 5.5. MM on shell and 8.1 MM on dished end. The detailed report is attached at Annexure-8.

7) DESORBER V-1301:

Visual inspection of the shell from top and bottom manholes was carried out. The following observations were made.

- a) Only the shell portion above the 1st tray and below the last tray could be inspected as the trays were not dismantled.
- b) The top portion of the shell was found reddish brown in colouration whereas the bottom portion was grayish black.

JOB CODE      JOB DESCRIPTION

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c) Tray at the top as well as bottom tray supports etc., were in tact in position.

d) The condition of the accessible weld joints was found satisfactory.

e) Ultrasonic thickness measurement was carried out on the bottom portion and top portion of the shell. Min. thickness on top shell was found to be 6.5 MM and on bottom shell, it was 6.4 MM against the design thickness of 6.0 MM. The detailed report is attached at Annexure-9.

8) FLASH TANK SCRUBBER V-1421.

Visual inspection and ultrasonic thickness measurement jobs were performed. The following observations were made during visual inspection.

a) The shell had assumed reddish brown colouration.

b) In general the weld joints were found free from corrosion and in satisfactory condition. However the circumferential weld seam below the manhole was found flush with the parent metal particularly in the south east location.

c) Minor sagging of the demister pads was observed.

d) One no. bolt was missing from the bottom supporting plate of packing.

e) Thickness measurement was carried out on shell and dished ends. Minimum thickness was observed to be 5.8mm on shell as well as dished ends, against the design thickness of 5 mm for shell and 6.00 mm for the dished end. The report is attached at Annex.10.

9) 1ST STAGE EVAPORATOR SCRUBBER V-1423:

Visual inspection and thickness measurement were carried out. The following observations were made:

a) Brownish red colouration was observed on inside surface of the vessel.

b) Three nos. fastening bolts of the top most tray were found missing.

c) Minor sagging of the demister pads was observed. Also, some urea particles were found stuck to demister pads.

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d) Thickness measurement revealed minimum thickness of shell=8.2mm against 8.00mm design thickness and thickness of dished end=12.1mm against 10mm design thickness. Detailed report on thickness measurement is enclosed herewith at Annex.11.

10) L.P. CARBAMATE CONDENSER H-1205:

After removal of the tube bundle, visual inspection of the shell was carried out. Thickness was also measured in the approachable area. The following observations were made:

- a) In general the condition of the weld joints and shell was found satisfactory.
- b) Bulging of appx. 12"x3" size having projection of appx. 10mm was observed on east side shell area at a distance of appx. 3 1/2 feet from top.
- c) Ultrasonic thickness measurement revealed minimum thickness 7.4mm of shell against design thickness of 7.0 mm. The report is attached herewith at Annexure-12.

11) FIRST STAGE EVAPORATOR SEPERATOR H-1422:

Visual inspection and ultrasonic thickness measurement were performed. The observations are given below:

- a) The shell inside surface was found blackish.
- b) Minor scaling was observed inside the tubes.
- c) The overall condition of all the weld joints of the vessel was found satisfactory.
- d) The impingment cone located at the centre and its supporting angles and pipes were intact in position. The welding of the reinforcement pads of the same with the shell was also free from corrosion.
- e) The seal welding of the tubes with the top tubesheet of the exchanger were found free from any defects.
- f) The distributor baffles provided at the top nozzle was in satisfactory condition.
- g) Minimum thickness on shell was found to be 13.2mm against design thickness 12.0 mm. On dished end minimum thickness was found to be 14.8mm against design thickness of 12.0 mm. Detailed report of thickness measurement is enclosed at Annex-13.

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12) AMMONIA WATER TANK T-1301:

Visual inspection of the internals and thickness measurement was carried out. The following observations were made:

- a) The tank has assumed brownish grey colouration on inside surface.
- b) Condition of all the shell welds, roof welds and bottom plate weld joints was satisfactory as no corrosion was noticed.
- c) The bottom plates were found buckled upward by appx. 3/4 inch at the centre. However, this was also observed during previous inspections.
- d) South portion of the tank behind the partition plate was found reddish brown in colouration.
- e) Loose packing rings were observed lying in the south compartment of the tank. These appeared to have got carried over from the connecting vessels.
- f) Thickness measurement was carried out. minimum thickness on shell was found to be 6.0mm against design thickness of 6.0mm and on bottom plate minimum thickness was found to be 7.8mm against design thickness of 7.0 mm. The detailed report on thickness measurement is enclosed herewith at Annex-14.

13) UREA SOLUTION TANK T-1401:

Visual inspection of the internals and thickness measurement of the tank shell and bottom plate were carried out. The following observations were made during visual inspection.

- a) The tank shell had assumed brownish red colouration. Some scales were observed stuck to the shell particularly in north direction.
- b) The bottom plate of the tank was found to have got buckled upwards at the centre by appx. 3/4", which was also observed in the past.
- c) The weld joints of the shell, bottom plates, and roof were in satisfactory condition and free from effects of corrosion.
- d) Ultrasonic thickness measurement revealed minimum thickness = 5.8mm on shell against design thickness of 6.0 mm and 6.0mm on bottom plate against design thickness of 6.0 mm. The detailed report of thickness measurement is enclosed herewith at Annex.15.

JOB CODE      JOB DESCRIPTION

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14) RECTIFYING COLUMN V-1202:

Visual inspection could be carried out from the bottom manhole only. The following observations were made during visual examination.

- a) The colouration of the shell was found brownish.
- b) All the weld joints were found free from any signs of corrosion and were in satisfactory condition.
- c) The weld joints of the nozzle located at the bottom centre were in good condition.
- d) Ultrasonic thickness measurement of shell and bottom dished was carried out. The report of thickness is enclosed herewith at Annexure-16.

02 41 06 ULTRASONIC THICKNESS MEASUREMENT OF PIPE LINES :

Ultrasonic thickness measurement of various pipe lines was carried out during this shut down. The detailed summary report on thickness is enclosed herewith at Annexure-17.

The following pipe lines were found to have considerable reduction in thickness and hence attention/ corrective action is recommended.

- 1) AR-1101-6" (K-1102 to GA-1102) : The min. thickness observed at certain portion of this line is 3.3 MM and hence, 53.5 % reduction has taken place. It is therefore suggested to replace the portion of this pipe line which has been observed to have thickness reduction. The pipe segment which needs replacement is highlighted in the report attached herewith.
- 2) PR-1224-3" (P-1201 A/B to H-1203) : The min. thickness observed on this pipe line is 5.6 MM i.e. 26.3 % reduction in thickness. It is therefore suggested to replace this pipe line. It is also suggested to increase the line size in view of the failures faced in this line in the past.
- 3) PR-1225-3" (P-1201 A/B Discharge Line): The min. thickness observed on this pipe line is 6.2 MM i.e. 27.5 % reduction in thickness. Replacement is therefore recommended.

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- 4) PR-1302-3" (P-1302 to H-1301A) : At bend points no. 24 and 26 shown in the sketch, the min. thickness has been observed to be 2.3 MM against the design thickness of 3.05 MM i.e. 24.6 % reduction in thickness. It is therefore suggested to replace these two bends during next shutdown. The min. thickness on the remaining portion of the pipe line is 2.8 MM which is safe.
- 5) PR-1359-4" (P-1351 A/B Disch.line to H-1351 C) : The min. thickness is observed to be 2.1 MM against the design thickness of 3.05 MM i.e. 31.1 % reduction in thickness. It is therefore recommended to replace this pipe line at the next available opportunity.
- 6) PR-1361-4" (V-1351 to H-1351A): At bend point no. 21, the min. thickness is found to be 2.3 MM i.e. 24.6 % reduction. In the remaining portion of this pipe line, the thickness is observed to be 2.8 MM. It is therefore recommended to replace the bend at point no. 21 as shown in the sketch attached.
- 7) PW-1103-8" (Battery limit to H-1104): The minimum thickness on this pipe line is observed to be 5.2 MM against the design thickness of 8.2 MM i.e. 36.6 % reduction in thickness. It is therefore recommended to replace this line.
- 8) PW-1351-4" (H-1301 to V-1301): The min. thickness of 2.4 MM has been observed on the bends of this pipe line which is against 3.05 MM design thickness i.e. 21.3 % reduction. In order to further assess the condition of this pipe line, it is proposed to undertake the detailed survey of this pipe line including the straight pipe length during next turn around/opportunity before recommending for replacement action.
- 9) SC-1506-4" (T-1501 to P-1505 A/B): The min. thickness has been observed to be 5.0 MM against the design thickness of 6.0 MM i.e. 16.9 % reduction is observed. However, as per the calculations of the Design group of Tech. Deptt. the min thickness recommended for replacement is 3.0 MM. In view of this, no action is required at present.
- 10) ST-1105-4" (ST-1104 to Q-1101-1): The min. thickness at bend points no. 12, 13 and 14 as per the sketch enclosed, the min. thickness is found to be 4.8 MM against the design thickness of 8.6 MM i.e. 44.1 % reduction in thickness is seen. It is therefore recommended to replace these three bends during next turn around. The min. thickness on the remaining portion of this pipe line is 7.5 MM which is safe.

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- 11) ST-1123-14" (PICV-1129 to ST-1106): The min. thickness is found to be 7.4 MM against the design thickness of 9.52 MM i.e. 22.2 % reduction in thickness. However, as per the design calculations given by the Design Group of Technical Deptt., the min. thickness recommended for replacement of this line is only 3.0 MM. So, no action is recommended at present.
- 12) ST-1116-12" (Q-1101-2 to V-1502): The min. thickness is found to be 7.3 MM against the design thickness of 9.52 MM i.e. 23.3 % reduction in thickness. However, as per the design calculations given by the Design Group of Technical Deptt., the min. thickness recommended for replacement of this line is only 5.25 MM. So, no action is recommended at present.

NOTE: THE ULTRASONIC THICKNESS MEASUREMENT REPORTS FOR THE ABOVE REFERRED PIPE LINES ARE ENCLOSED HEREWITH AT ANNEXURE-18.

( DETAIL INSPECTION REPORT CAN BE SEEN IN INSPECTION SECTION WITH ALL ANNEXURES )

Annexure-17

UREA PLANT PIPE LINES

SR. NO.	LINE NO.	N.B. (in.)	SCH.	DESIGN THK. MM	LINE DESCRIPTION FROM	TO	MIN THK SD-97 MM	% RED	REMARKS
AR-AIR LINE:									
1	AR-1101	6	B1	7.1	K-1102	GA-1102	3.3	53.5	Partial replacement recommended.
GA-ACID GAS LINE:									
2	GA-1102	30	B3	6.3	H-1104	V-1101	5.9	6.3	
3	GA-1103	30	B3	6.3	V-1101	K-1101-1	6.3	--	
4	GA-1104	10	B3	4.19	V-1112	K-1101-2	4.0	4.5	
5	GA-1112	6	F2	14.2	K-1101-2	GA-1201	13.0	8.4	
6	GA-1201	6	X4	15.24	GA-1112	H-1201	12.0	19.2	
7	GA-1202	1	F2	6.3	GA-1112	CHECK VALVE	5.2	17.4	
MA-AMMONIA LINE:									
8	MA-1105	6	C2	7.1	V-1103	P-1102	6.2	12.6	
PR-UREA/CARBAMATE SOLUTION:									
9	PR-1202	10	X1	24.33	H-1201	H-1202	26.0	--	
10	PR-1203	8	X1	19.58	H-1202	V-1201	18.0	7.5	
11	PR-1204	8	X1	19.58	H-1202	V-1201	19.0	3.9	
12	PR-1205	6	X1	15.2	H-1201	V-1202	15.0	3.2	
13	PR-1205	8	X1	19.5	H-1201	PR-1205	18.0	8.2	
14	PR-1206	6	X6	3.4	V-1202	LICV-1201	3.3	2.9	
15	PR-1207	6	X10	3.4	V-1406	LICV-1201	3.4	--	
16	PR-1208	4	X1	10.4	V-1201	H-1203	9.0	14.0	One bend replaced in SD-97
17	PR-1212	4	X1	10.4	H-1203	V-1201	10.0	2.8	
18	PR-1214	12	X6	4.57	V-1202	H-1204	3.8	16.8	
19	PR-1215	16	X6	4.78	H-1204	V-1202	5.0	--	
20	PR-1219	8	X3	3.76	V-1205	H-1205	3.3	12.2	
21	PR-1223	4	X3	3.06	V-1205	P-1201 A/B	2.5	18.3	
22	PR-1224	3	X4	7.6	P-1201 A/B	H-1203	5.6	26.3	Replacement recommended.

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## Annexure-17

## UREA PLANT PIPE LINES

SR NO	LINE NO.	N.B. (in.)	SCH.	DESIGN THK.MM	LINE DESCRIPTION FROM	TO	MIN THK SD-97 MM	% RED	REMARKS
23	PR-1225	3	X4	8.55	P-1201 A/B	PR-1225	6.2	27.5	Replacement recommended.
24	PR-1230	6	X1	15.24	MA-1203	H-1202	15.0	4.1	
25	PR-1232	4	X1	10.41	PRCV-1201	H-1205	8.6	17.3	
26	PR-1235	4	X3	3.05	V-1203	P-1210 A/B	3.0	---	
27	PR-1302	3	X3	3.05	P-1302	H-1301A	2.3	24.6	At bend point 24 & 26. Rest=2.8mm Replacement rec. for two bends
28	PR-1305	3	X3	3.05	H-1301	V-1301	2.5	18.0	
29	PR-1356	3	X7A	3.05	V-1351	V-1352	2.6	14.7	
30	PR-1359	4	X7	3.05	P-1351A/B DIS	1351-C	2.1	31.1	Replacement recommended
31	PR-1361	4	X7A	3.05	V-1351	1351-A	2.3	24.6	At bend point 21. Rest=2.8mm Replacement rec. for one bend
32	PR-1367	3	X6	3.05	V-1353	P-1352A/B	6.1	---	
33	PR-1373	4	X3	3.05	P-1351B DIS	PR-1361	2.6	14.7	
34	PR-1401	8	X10	3.76	V-1406	T-1401	3.8	---	
35	PR-1403	6	X3	3.4	T-1401	P-1401	3.0	11.8	
36	PR-1404	4	X3	3.05	P-1401A/B	P-1406			
37	PR-1405	6	X10	3.4	H-1422	H-1424	3.4	---	
38	PR-1406	4	X3	3.05	PR-1404	H-1422	6.1	---	
39	PR-1408	3	X10	3.05	P-1408	M-1401	3.4	---	
PW-PROCESS WATER LINES:									
40	PW-1103	8	B13	8.2	B/L	H-1104	5.2	36.6	Replacement recommended.
41	PW-1104	10	B6	4.19	H-1104	P-1106	4.0	4.5	
42	PW-1501	2	B1	4.5	B/L	T-1501	5.6	---	
43	PW-1351	4	X3	3.05	H-1301	V-1301	2.4	21.3	Detailed Survey needed.
SC-STEAM CONDENSATE LINES:									
44	SC-1210	8	C2	8.18	P-1204	SC-1210	8.7	---	
45	SC-1210	10	C2	9.3	P-1204	H-1207	8.5	8.6	

## Annexure-17

## UREA PLANT PIPE LINES

SR NO	LINE NO.	N.B. (in.)	SCH.	DESIGN THK.MM	LINE DESCRIPTION FROM	TO	MIN THK SD-97 MM	% RED	REMARKS
46	SC-1216	4	B4	6.0	H-1204	SC-1407	6.3	---	
47	SC-1502	3	B4	5.49	P-1501/6	V-1501	5.8	---	
48	SC-1506	4	B4	6.0	T-1501	P-1505A/B	5.0	16.9	Min.Required THK=3.0MM
49	SC-1507	3	B4	5.5	P-1505A/B DIST	T-1501	6.2	---	
50	SC-1510	2	F1	5.5	P-1502	PCV-1501	4.5	18.2	
ST-STEAM LINE:									
51	ST-1105	4	E3	8.6	ST-1104	Q-1101-1	4.8	44.1	At Bend Pt.12,13,14 REST=7.5MM Replacement reco.for above 3 Bends
52	ST-1123	14	B4	9.52	PICV-1129	ST-1106	7.4	22.2	Min.Required THK=3MM
53	ST-1116	12	C1	9.52	Q-1101-2	V-1502	7.3	23.3	Min.required THK=5.25MM
54	ST-1116	8	8.1	8.18	Q-1101/2	EXHAUST			
55	ST-1119	2	D1	3.91	ST-1101	Q-1113	4.1	---	
56	ST-1125	8	C1	8.18	ST-1116	PICV-1129	8.6	---	
57	ST-1129	10	C1	9.27	PICV-1128	ST-1126	8.0	13.7	
58	ST-1206	8	B4	8.2	ST-1506	H-1204	7.9	3.6	
59	ST-1209A	3	D1	5.48	40ATA HDR	Q-1201/A	5.5	---	
60	ST-1209B	3	D1	5.48	40ATA HDR	Q-1201/B	5.6	---	
61	ST-1352	3	5.5	5.48	23ATA HDR	HYDROLYSER	4.6	16.0	
62	ST-1352	3	3.04	3.04	23ATA HDR	HYDROLYSER	2.8	7.8	
63	---	4	SCH40	6.0	Q-1051	EXHAUST LINE	5.4	10.0	
64	---	6	SCH40	7.1	Q-1051	EXHAUST LINE	5.7	19.7	
65	---	-	NA		NEW BOILER	60ATA STM HD	22.0	---	
66	ST-5151	8	12.7	12.7	60ATA STM LINE ON PIPERAC		11.0	14.9	

PLANT TURNAROUND - MAY - JUNE 1997

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UREA PLANTCIVIL JOBS

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<u>JOB CODE</u>	<u>JOB DESCRIPTION</u>
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02 51 01 CIVIL JOBS :

1. Acid/Alkali proof brick lining work on scrapper floor including removing existing damaged floor and carting away the debries.
2. Epoxy painting of side wall of "Prill Tower", Conveyor gantry in-side and outside of prilling room, Lift cabin, R.C.C.Structure, R.C.C.Slabs. Beams and columns of Prill cooling unit. CO2 spray cooler.
3. Casting of concrete at first floor.
4. Making temperary approach road for crane movement on south side of prill tower, One (1) meter high (8) Eight meter wide and (40) forty meter long.

PLANT TURNAROUND - MAY - JUNE 1997UREA PLANTELECTRICAL JOBS

JOB CODE	JOB DESCRIPTION
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02 61 01 ELECTRICAL JOBS :

1. Preventive maintenance carried out on following transformers : TR-7A, 7B and TR 17
  - a) Primary and secondary cable boxes, end terminations were checked and connections were tightented.
  - b) Tested oil in marshalling boxes on primary and secondary transformers.
  - c) Replaced of silicagel in dehydrating breather of above transformers.
  - d) Checked trip alarm circuit and cleaning of all emergency trip boxes.
  - e) Checked IR value of primary and secondary windings of above transformers
2. Preventive maintenance of TMG/Siemens make LT ACBs installed at MCCs was carried out and replaced damaged parts and worn out contacts.
3. Indicating lamps of breaker pannel were replaced.
4. Preventive maintenance carried out an all feeders compartments mounted on the following MCCs :  
MCC 6 and MCC 14.
5. Tested all type of relays installed in the above MCCs.
6. Maintenance of all lighting distriution boards was carried out and replaced burnt out fuse fittings etc.
7. Overhauling of following motors were carried out:  
P-1113B, M-1419, M-1421, M-1402/2, P-1408.
8. Preventive maintenance of all motor operated valve local control panels were carried out.
9. Checked terminal boxes for loose connections, burning of cables etc. of all motor above 20 HP.

CO

ISO 9002

PLANT TURNAROUND - MAY - JUNE 1997

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UREA PLANT

INSTRUMENT JOBS

PLANT TURNAROUND - MAY - JUNE 1997

UREA PLANT

INSTRUMENT JOBS

JOB CODE	JOB DESCRIPTION
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02 71 01 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.

Worked with mech.maint. & prodn. people to carry out over speed trip test of both the compressors,i.e. centrifugal and P.B.compressor till the tests were carried out successfully.

All the O.E.N. make relays in comp.relay panel box were checked on relay testing box,for the proper functioning of the relays and all the relays found alright.

Kickback valves' positioners,air regulatos were serviced/cleaned and stroking carried out.Also,FRC 1-1 Controller was checked/calibrated along wiyh the set point transmitter.

All the alarm and trip swithes were overhauled & checked for correct settings.

CONTROL VALVES :

(1) HICV-1201:- The control valve.was dropped from the line.The plug and seat were replaced by new ones.The gland packings,guide sleeve of the process stem,were also replaced by new ones.The valve positioner and valve position transmitter were overhauled/cleaned and refixed.The actuator diaphragm also was replaced by a new one.The control valve was refixed after stripper maint./cleaning and flushing job was over.And then,the valve positioner/valve position transmitter were refixed and their calibration was successfully carried out locally as well as from control room.

(2) LRCV-1201:- The control valve was dropped from the line.The plug and seat were repaired by taking fine finishing cut for tight shut off.The gland packings,guide sleeve of the process stem,were also replaced by new ones.The valve positioner and valve position transmitter were overhauled/cleaned and refixed.The actuator diaphragm also was replaced by a new one.Hydro test of the control valve @ 150 kg/cm2 was carried out for 20 minuites. The valve was refixed after H.P.System maint./cleaning and flushing job was over.And then,the valve positioner/valve position transmitter were refixed and their calibration was successfully carried out locally as well as from control room.

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(3) PRCV-1201:- The control valve was dropped from the line. The plug and seat were repaired by taking fine finishing cut and lapping for tight shut off. The gland packings were also replaced by new ones. The valve positioner was overhauled/cleaned. The actuator diaphragm also was inspected and found alright. The valve was refixed after H.P. System maint./cleaning and flushing job was over. And then, the valve positioner refixed and its calibration was successfully carried out locally as well as from control room. The valve was removed again and refixed to facilitate mech. maint. people to fix H.P. Scrubber.

(4) PRCV-1128:- The control valve was dropped from the line, to facilitate taking steam taping for stripper cleaning job. The valve was brought to inst. workshop and plug and seat were replaced along with cooling/sealing sleeve and bushes of the trim portion. Gland packing were replaced. The actuator was also completely serviced, rubber parts were replaced by new ones. The hand jack assembly worm gear and main gear were replaced to make the assembly properly functional. The valve positioner was overhauled/cleaned. And then, the valve positioner refixed. Its function checked, stroking carried out. The valve was refixed after Stripper and steam line maint./cleaning and flushing job was over. The control valve stroking was successfully carried out from control room.

(5) LCV-1301 Valve:- The MIL make new control valve was installed in place of the old existing one, as the old control valve's body was repaired by welding due to leakage and the characteristic of the valve was not fully satisfactory. Necessary air tubing was modified to suit the new control valve as the new one is diaphragm operated where as the old one was piston operated. Proper stroking/calibration from control room was carried out and the valve was found functioning properly when it was taken into service as the plant started production.

(6) PRCV-1202:- The valve was brought to inst. w/s. Actuator was checked and found in good condition. The plug was found damaged in the seating area, so, a new plug from s.s. material was fabricated in our central mech. w/s. The gland packing were replaced. The valve was reassembled. The valve positioner and air regulator were cleaned and valve stroking set right. The valve was fixed back in its position. The control valve's function from control room also was found alright, after refixing.

(7) PRCV-1121:- The valve was brought to inst. w/s. Actuator was checked and carried out overhauling. The actuator "O" rings were replaced. The actuator was reassembled. Stroke checked & refixed in the line.

JOB CODE                      JOB DESCRIPTION

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(8) TICV-1422:- The control valve was dropped from the line, the valve was reinstalled in the temporary steam line, to facilitate taking steam for stripper cleaning job. After stripper cleaning job, the valve was brought to inst. workshop. The plug and seat were found in good condition. Gland packing were replaced. The actuator was also completely serviced, rubber parts were replaced by new ones. The valve positioner was overhauled/cleaned and then, the valve positioner refixed. The valve was refixed after Stripper and steam line maint./cleaning and flushing job was over. The control valve stroking was successfully carried out from control room.

(9) LICV-1201:- The valve was externally cleaned in its position. Valve positioner and air regulator were cleaned and serviced. Actuator's pneumatic performance was checked and carried out calibration of valve stroke. Hand jack assembly was replaced by a spare new one as the old one was not functioning properly. Performance on air and with hand jack are now alright.

(10) LICV-1501:- The control valve was dropped from the line, the valve was reinstalled in the stripper cleaning effluent drain line, to facilitate draining stripper cleaning job. After stripper cleaning job, the valve was brought to inst. workshop. The plug and seat were found in good condition. Gland packing were replaced. The actuator was also completely serviced, rubber parts were replaced by new ones. The valve positioner was overhauled/cleaned and then, the valve positioner refixed. The valve was refixed after Stripper and steam line maint./cleaning and flushing job was over. The control valve stroking was successfully carried out from control room.

(11) LICV-1351:- The valve was opened from the bonnet to inspect plug and seat condition to find if any foreign material has damaged the trim, because in the running condition the valve was not performing properly even though the pneumatic side was coming alright. After opening from the bonnet, a welding sludge, was found in the seat cavity, which was creating trouble. Otherwise seat and plug were in excellent condition. The valve was reassembled and pneumatic side was serviced/cleaned and proper stroking from control room was satisfactorily carried out.

(12) LICV-4603:- <Dry Ice Plant> The control valve was dropped from the line, the valve plug and seat were lapped for tight shut off. Yoke nut was replaced by a newly fabricated one as the original cast iron broke while dismantling the valve. The actuator is in good condition. Gland packing carried out. Bonnet studs are replaced with s.s. ones. Stroking carried out after servicing Pneumatic side. The valve refixed in position.

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(13) FRCV-1302:- The control valve actuator was brought to inst. w/s and it was completely serviced/overhauled. The actuator seal "o" rings were replaced by new ones. The "auto/manual" switch was also replaced by a spare new one. The actuator was refixed in position and stroking was carried out successfully from the control room.

(14) The following control valves' air regulator and valve positioners were cleaned/serviced along with auto-manual switch(if applicable) and gland packing carried out with new gland packing after removing old gland packings wherever required.

- 1) FICV-1352, 2) LICV-1353, 3) FICV-1351, 4) PICV-1353,
- 5) PICV-1129, 6) PICV-1130, 7) FRCV-1421, 8) FRCV-1204,
- 9) FRCV-1201, 10) PICV-1201, 11) PRCV-1504, 12) TICV-1121,
- 13) FRC-1-1, 14) HICV-1202, 15) MICV-1122, 16) LICV-1502A,
- 17) PICV-1501A, 18) PICV-1202, 19) LICV-1203, 20) PICV-1235,
- 21) HICV-1204, 22) PICV-1201, 23) PICV-1131, 24) HICV-1422A,
- 25) HICV-1422, 26) LICV-1123A, 27) LICV-1123B,
- 28) HICV-1221A, 29) HICV-1221B, 30) FRCV-1421

FIELD TRANSMITTERS:-

The following field transmitters were removed with air supply regulator from position brought to inst. workshop cleaned/serviced air regulator and the transmitter. The transmitter was calibrated and fixed in position along with the regulator.

- 1) PIC-1502, 2) LI-1421, 3) LIC-1351, 4) LI-1354,
- 5) LI-1352, 6) FT-1301, 7) FT-1302, 8) FT-1303,
- 9) FT-1304, 10) FT-1351, 11) LT-1301, 12) FT-1352
- 13) PIC-1202, 14) LIC-1235, 15) LIC-1420.

SECOND EVAPORATOR :

The vessel, H-1422, was replaced by a new one, we have carried out the following jobs to facilitate this modification :-

- 1) All the inst. connected to old vessel and associated pipe lines which were to be removed, were removed to facilitate lifting of the vessel/pipe lines.
- 2) After the new vessel/pipe lines were fixed, PRC-1421 Tx was installed in new location and necessary piping and tubing was carried out in co-ordination with piping contractor and Tx was calibrated, also. Local PI and LP lag for LRC-1421 were appropriately connected. The rotameter in the air purge line was also serviced and refixed.

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JOB DESCRIPTION

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BATTERY CHARGER :

The battery was disconnected and relocated to facilitate the DCS panels installation work in the room. The battery was connected again and charging and discharging was carried out to see the performance of the system. Found alright.

STRIPPER CLEANING JOB :

Worked with mech. maint. and prodn. people to facilitate their job of stripper cleaning. The following jobs were done for this purpose:-

- 1) Two control valves were temporarily installed to regulate steam flow and used chemical draining.
- 2) A rotameter was provided in the steam line to observe steam flow.
- 3) A J-type thermocouple was provided on stripper top cover. Along with the T/C, a local electronic type temperature indicator was provided. Also, the flow controlling provision was made with help of LIC-1204 local controller. A temporary level gauge was provided in the stripper to observe cleaning chemical level in the stripper.
- 4) A dial thermometer and a level monitoring gauge tube were provided in the chemical preparation tank.
- 5) After the cleaning job was over, a pneumatic type delta P measuring provision for measuring pressure drop across the stripper ferrules were provided, along with necessary air tubing/regulator. The arrangement was removed when the ferrule testing was completed.

COOLING WATER TEMPERATURE POINTS:

Some points in cooling water system were provided to temporarily measure cooling water temperature for the heat balance calculation purpose by the technical deptt. people.

H.P. SYSTEM AND H.P. STEAM THERMOWELL :

The H.P. System thermowells and H.P. Steam thermowells were inspected for their condition to withstand high pressure/temperature and were found alright. They were refixed in their position.

LR-1201 (RADIO ACTIVE SOURCE) :

Removed the radio active source from the Autoclave, to facilitate vessel entry. The source was refixed, after completion of Autoclave job.

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LRC-1201 (RADIO ACTIVE SOURCE):

Removed the radio active source from the Stripper, to facilitate vessel entry. The source was refixed, after completion of Stripper job.

AUTOCLAVE AND H.P. SCRUBBER :

Provided and arranged PI Gauges, tubing, fittings, regulators, etc. from time to time for leak testing by insp., mechanical, prod. people through weep-hole by injecting steam, Air, 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 prodn. people for confirming that there was no leak as autoclave and the scrubber were on stream.

CONDUCTIVITY METER FOR H-1202 4 ATA STEAM :

A) New sample point taken for H-1202 4 ata conductivity was taken in line and bigger size sample cooler was installed and taken in line.

B) A new microprocessor based, programmable conductivity indicating transmitter giving 4 to 20 mA output was installed in place of the old one and necessary wiring, etc. was done for indication in the control room.

PRILLING VALVE POSITION ALARM SYSTEM  
HICV-1421 (PRILL DIVERT VALVE ):

HICV-1421 control valve position alarm system was provided to annunciate valve position showing "Prill in line" or Prill diverted" in Au-4. The arrangement is provided with help of proximity switches on both the extreme positions of the manually operating lever.

FS-1101:

The on-line inst. FS-1101, turbine flowmeter was dropped from the line. The turbine bearings and all other internals were inspected and found alright. Refixed the instrument in line.

LIC-1420 :

Local receiver controller and control valve were relocated in accordance with the modification carried out for a knock out drum installed before the control valve LICV-1420, the level transmitter is now installed on the newly installed knock out drum. Appropriate air and signal tubing have been done. Performance was checked as a local controller and found alright.

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FIELD INSTRUMENT FOR ISO 9002:

All the instrument declared as field calibration standard instruments for ISO 9002 were calibrated and appropriate record was prepared, as the half yearly calibration of these instrument was due.

PLANT TURNAROUND - MAY - JUNE 1997UREA PLANTTECHNICAL & PROJECT DEPARTMENT JOBS

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 JOB CODE                      JOB DESCRIPTION
 

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02 81 01 TECHNICAL DEPTT. JOBS :

- 1) Provision of three way valves alongwith spare Relief valves on Ammonia line. RV-1101, RV-1106, RV-1107 (3 Nos) Relief valves replaced for better safety purposes.
- 2) Two nos strainers placed in C.W. line to H-1206. Newly placed for better performance.
- 3) Knock-out pot for H-1422 outlet condensate. Newly placed for better performance. This pot will avoid L.P. Steam passing to Dearator and maximum surface area will be utilised for heat transfer.
- 4) Tappings for liquid CO2 plant.

02 81 02 PROJECT JOBS :

- 1) Existing Reactor Trays, Funnel and Downcomer pipe in Autoclave have ben removed. Fixing of all the 11 Nos. Trays alongwith funnel and Downcomer pipe has been completed.
- 2) New Prilling machine has been erected.
- 3) Chemical cleaning of H.P. Stripper Tube has been carried out by M/s. HOUSEMAN.
- 4) Modification in Recirculation Heater has been completed.
- 5) Waste Water Cooler (H-1303) has been erected.
- 6) Second stage Evaporator & Separator (H/V-1424) has been placed on foundation. Erection is completed and commissioned.
- 7) L.P. Carbamate Condenser (LPCC) has been placed on , foundation and alignment has been completed.
- 8) Tapping points (52 Nos) have been completed.
- 9) CO2 Centrifugal Compressor, Turbine and Condenser for CO2 Centrifugal compressor has been placed on foundation. Erection of Auxiliaries equipment is in progress.

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- 10) Erection and Alignment of New Drives with existing H.P. Ammonia pump and H.P. Carbamate pump have been completed.
- 11) Deck slabs for CO2 Centrifugal compressor has been completed. Foundation work for CO2 Centrifugal Compressor has been completed. Foundation work for Auxiliaries equipment and building columns are in progress.
- 12) Civil work for cable-trenches and extension of Urea control Room for DCS (Urea) System is under progress.
- 13) Erection of structural building columns has started.
- 14) Foundation work for HP Ammonia pump and structural work for 2nd stage Evaporater & Seperator has been completed.
- 15) DCS has been received at site and installation job is in progress. Support for cable tray and tubing is under progress.
- 16) N/C Ration meter is being placed at site and jobs pertaining to commissioning at site is in progress.

PLANT TURNAROUND - MAY - JUNE 1997

OFFSITE & UTILITY PLANT

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MECHANICAL JOBS

JOB CODE            JOB DESCRIPTION

03 02 01    F.D.FAN TURBINE & GEAR BOX  
Q-5113 PREVENTIVE MAINTENANCE

Main cover opened and bearing inspection done and found Okay. Governing system checked and found okay.

Following are the bearing clearances.

TURBINE SHAFT HIGH SPEED :

- a) F.D.Fan side                    : 0.004"
- b) Turbine side                    : 0.004"
- c) Axial thrust                    : 0.010"

LOW SPEED SHAFT OF GEAR BOX :

- a) Coupling side                    : 0.005"
- b) Turbine side                    : 0.004"
- c) Axial thrust                    : 0.006"

03 02 02    F.D.FAN K-5113 PRIVENTIVE MAINTENANCE :

Bearing inspection done, found okay, oil "Servo System 150" changed. Clutch oil "Servo Transfluid - A" Filtered and refilled. Clutch in general found O.K.

03 02 03    BOILER FEED WATER PUMPS :

(A) P-5111 B.F.W.PUMP TURBINE DRIVEN :

- 1) Bearing inspection done and general condition of bearings found O.K.

Followings are the clearances.

- Coupling side                    : 0.12 MM
- Free end side                    : 0.12 MM
- Thrust                            : 0.37 MM

- 2) Oil cooler opened, cleaned from tube side & boxed up.
- 3) Consol oil drained, cleaned & new oil replaced.
- 4) Coupling greasing done by B.R.B.100 grease after cleaning of coupling from inside.

JOB CODE

JOB DESCRIPTION

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03 02 04 Q-5111 B.F.W. PUMP TURBINE :

- 1) Bearing inspection done and general condition of bearing found O.K.

Following are the clearances.

Coupling side	:	0.3 MM
Governor side	:	0.22 MM
Thrust	:	0.25 MM

- 2) Lube oil cooler opened, cleaned from both side tube and shell side and boxed up. Sump also cleaned and boxed up.
- 3) Woodward governor replaced by new one, because of old governor was hunting about 600 RPM and found badly corroded from inside.

03 02 05 BOILER FEED WATER PUMP (MOTOR DRIVEN) : p. 5512(A) BFW PUMP :

- 1) Bearing inspection done and governor condition of bearing found O.K.

Followings are clearances.

a) Motor side	:	0.12 MM
b) Free end side	:	0.11 MM
c) Thrust	:	0.54 MM

- 2) Lub oil console oil drained, cover opened, cleaned and fresh oil charged.
- 3) Lube oil cooler opened from both side, shell side and tube side, cleaned & boxed up.

(B) GEAR BOX :

When Boiler feed water pump was in operation the oil temp. suddenly shot up and all connected lines got heated. On opening gear box cover, oil lines, oil filter, followings were observed.

- 1) Oil was burnt and was black in colour containing mock and metallic particals.
- 2) Filter element was badly chocked.
- 3) Bearing of gear box (Low speed shaft & high speed shaft were damaged badly.
- 4) Gear shaft was found damaged on bearing portion.
- 5) Shaft of the M.O.P. found broken.
- 6) A.O.P seal was found leaking.

JOB CODE

JOB DESCRIPTION

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Followings jobs were done.

- a) All oil line were cleaned & flashed with steam, air and boxed up.
- b) New oil filter assembly with new oil filter element was installed.
- c) A.O.P. was replaced with new one.
- d) Low speed shaft with gear and high speed shaft and pinion with all four nos bearings (2 Nos high speed and 2 Nos low speed). Low speed thru cap and main oil pump replaced with new one.
- e) Relief valve overhauled and boxed up. When system was taken in to operation the following were oil pressure reading.

A.O.P. : 2.55 Kgf/cm<sup>2</sup>  
 M.O.P. : 1.8 Kgf/cm<sup>2</sup>  
 Cut off setting : 1.6 Kgf/cm<sup>2</sup>

Following are the bearing clearance.

A) High speed shaft :

Motor side : 0.16 MM

Pump side : 0.18 MM

B) Low speed shaft :

Motor side : 0.16 MM

Pump side : 0.14 MM

03 02 06 COOLING WATER PUMP TURBINE Q-4401-A :

The turbine was removed from its location and deposited in stores duly painted.

03 02 07 C.W. PUMP TURBINE Q-4401-B :

This was overhauled during January - 1997.

Following are the shaft dimensions.

A) Coupling side :

- 1) Big dia at carbon ring are : 106.85 MM dia
- 2) Small dia " : 96.85 MM dia
- 3) Bearing area shaft dia : 75.9 MM dia

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JOB DESCRIPTION

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B) Free end side (Governor side) :

- 1) Big dia at carbon ring are : 106.85 MM dia
- 2) Small dia " " : 96.85 MM dia
- 3) Bearing area shaft dia : 75.88 MM dia

Journal bearing clearance :

- Coupling side : 0.008"
- Governor side : 0.009"

Oil guard clearance (Laby.rinth) :

- Coupling side : 0.004" both side
- Governor side : 0.004" both side

C) Carbon ring clearance :

a) Big carbon rings steam exchust side.

- i) Rotor size : 106.85 MM

ii) Carbon ring size Clearance

- 1) 107.10 MM dia 0.25 MM
- 2) 107.10 MM dia 0.25 MM
- 3) 107.05 MM dia 0.20 MM
- 4) 107.05 MM dia 0.20 MM
- 5) 107.05 MM dia 0.20 MM

b) Small carbon rings steam exhaust side.

- i) Rotor size : 96.85 MM

ii) Carbon ring size Clearance

- 1) 96.97 MM 0.12 MM
- 2) 96.97 MM 0.12 MM

c) Big carbon ring steam inlet side.

- i) Rotor size : 106.85 MM

ii) Carbon ring size Clearance

- 1) 107.15 MM dia 0.30 MM
- 2) 107.15 MM dia 0.30 MM
- 3) 107.10 MM dia 0.25 MM
- 4) 107.08 MM dia 0.23 MM
- 5) 107.05 MM dia 0.20 MM

d) Small carbon rings steam inlet side.

- i) Rotor size : 96.85 MM

ii) Carbon ring size Clearance

- 1) 97.00 MM 0.15 MM
- 2) 97.00 MM 0.15 MM

JOB CODE

JOB DESCRIPTION

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- e) Mech.govenor overhauled.
- f) Over speed trip at : 6250 RPM
- g) Parts changed.
  - 1) All carbon rings
    - Code - 333202126 : 10 Nos
    - 333202134 : 04 Nos
  - 2) Governoer side laby.rinth.
    - Part No. 105/1
    - Code No. 333202237
  - 3) Governor fly weight bearings - 8 Nos.
    - Code No. 333202109
  - 4) Bearings for linkages to governor.
    - Brg.No.RIR 1416/B 1816 Needle roller brg.
    - Code No. 455010040 : 2 Nos
  - 5) Oil filter elements.
    - Code No. 333202040 : 2 Nos

03 02 08 C.W.PUMP TURBINE Q-4401-B :Gear box :

This was overhauled during January 1997.

Shaft diameter of Gear box.

- 1) High speed gear.
  - a) Pump side : 81.90 MM dia
  - b) Turbine side : 81.93 MM dia
- 2) Low speed gear.
  - a) Pump side : 151.80 MM dia
  - b) Turbine side : 151.80 MM dia

Bearing clearance.

- 1) High speed gear.
    - a) Pump side : 0.12 MM
    - b) Turbine side : 0.12
  - 2) Low speed gear.
    - a) Pump side : 0.17 MM
    - b) Turbine side : 0.15 MM
- Backless of gear : 0.5 MM  
 Axial thrust of high speed gear : 0.7 MM  
 Low speed gear : 0.25 MM

JOB CODE

JOB DESCRIPTION

162

Parts changed.

- High speed bearing : 2 Nos
- Low speed bearing : 2 Nos

03 02 09 P-4401 C & D :

- (B) Decoupled the coupling, cleaned and greasing done of both pumps. Gland packing replaced of both pumps.
- (C) P-4401 D Pump was kept down and for fabrication and erection of C.W.inter connection piping of new and old C.W.sump for more two months this pumps was not in operation. When pump was taken in operation the rotor was found jammed in the impeller neck rings and stuffing box bush. The pump was taken for complete overhauling.

Rotating element found innternal O.K.slightly scrapping mark found on bearing eara. The coupling side bearing was found complete damaged. The damaged portion of bearing was machined 0.2 MM cut was taken on shaft at on bearing area.

Bearing clearance :

P-4401-C	P-4401-D
Coupling side	Coupling side
Free end side	Free end side

03 02 10 C.W.PUMP P-4402 (UREA MOTOR DRIVEN) :

Overhauling the pump.

- a) Rotating assembly found O.K.
- b) Gland portion of sleeve was found scored on both sides. Machining out of (1.5 MM) was taken to smoothen the surface. The total clearance of sleeve was reduced by 3 MM.

Parts changed :

- 1) Gland packing & casing gasket.
- 2) Coupling side journal bearing.

Journal bearing clearance.

- Free end side : 0.007"
- Coupling side : 0.007"
- Axial thrust : 0.022"

JOB CODE            JOB DESCRIPTION

163

C.W.PUMP P-4403 :

Overhauling the pump.

- a) Impeller was found badly eroded.
- b) One no pump foundation bolt found broken. Pump bottom casing removed from foundation, all foundation bolts replaced.

(Bolt side : 1 1/4" BSW x 5 1/2" long studs)  
Four Nos Jack bolts also provided for alignment.

Parts changed.

- 1) Rotating element.
- 2) Gland packings & casing gasket.

Journal bearing clearance.

Pump side            : 0.010"  
Coupling side        : 0.010"

03 02 11 C.W.PUMP TURBINE Q-4403 :

Q-4403 C.W.Pump turbine was overhauled during Feb,1997.

Shaft dimensions :

(A) Coupling side :

- 1) Big dia at carbon ring area        : 109.78 MM
- 2) Small dia at carbon ring area     : 99.74 MM
- 3) Journal brg.area shaft dia        : 76.85 MM

(B) Free end side (Governor side)

- 1) Big dia at carbon ring area        : 109.78 MM
- 2) Small dia at carbon ring area     : 99.74 MM
- 3) Journal brg.area shaft dia        : 76.85 MM

JOURNAL BEARING CLEARANCE :

Coupling side        : 0.17 MM  
Governor side        : 0.17 MM

OIL GUARD CLEARANCE (LUBY RINGTH ) :

Coupling side        : 0.004" both side  
Governor side        : 0.004" both side  
  
Axial thrust            : 0.009"

JOB CODE

JOB DESCRIPTION

765

Carbon ring clearance :

a) Big carbon rings steam exhaust side.

- i) Rotor size : 109.78 MM
- ii) Carbon ring size Clearance
- 1) 110.03 MM dia 0.25 MM
- 2) 110.03 MM dia 0.25 MM
- 3) 109.98 MM dia 0.20 MM
- 4) 109.98 MM dia 0.20 MM
- 5) 109.93 MM dia 0.15 MM

b) Small carbon rings steam exhaust side.

- i) Rotor size : 99.74 MM
- ii) Carbon ring size Clearance
- 1) 99.86 MM dia 0.12 MM
- 2) 99.86 MM dia 0.12 MM

c) Big carbon rings steam inlet side.

- i) Rotors size : 109.78 MM
- ii) Carbon ring size Clearance
- 1) 110.08 MM dia 0.30 MM
- 2) 110.08 MM dia 0.30 MM
- 3) 110.03 MM dia 0.25 MM
- 4) 110.00 MM dia 0.22 MM
- 5) 109.98 MM dia 0.20 MM

d) Small carbon rings steam inlet side.

- i) Rotor size : 99.74 MM
- ii) Carbon ring size Clearance
- 1) 99.89 MM dia 0.15 MM
- 2) 99.89 MM dia 0.15 MM

e) Mech.governor overhauled.

f) Overspeed trip at 6200 RPM.

g) Parts changed :

- 1) All carbon rings.  
Code : 333202126 - 10 Nos  
333202134 - 04 Nos
- 2) Governor fly weight bearings - 8 Nos  
Brg. No. 629 ZZ  
Code : 333202109
- 3) Oil filter elements.  
Code : 333202040 - 2 Nos

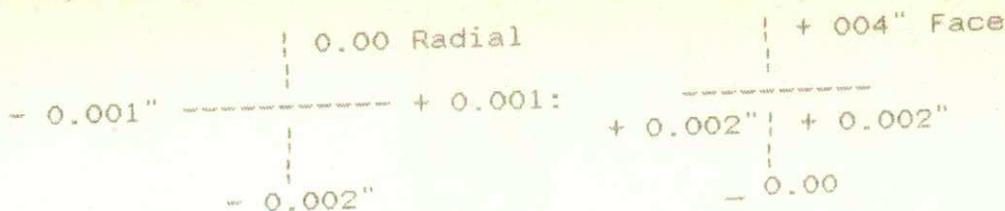


JOB CODE

JOB DESCRIPTION

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4) Alignment readings.



5) After overhauling the pump following are the operating parameters.

Disch.pressure : 4.00 Kg/cm2  
Amp : 158  
Flow : 320 m3/hr

Suction strainer of P-4101-A pump made of FRP was changed by C.S.casing and S.S.strainer element. Also changed C.S.reducer.

03 02 14 L.S.H.S. PUMP TURBINE Q-5113 :

Complete overhauling done.  
Parts replaced :

Carbon ring changed.  
Bearing changed : 6307 - 45501113 : 1 No  
NU 309 - 455007208 : 1 No

Complete pump was replaced by spare one as there was leakage from mechanical seal. Quick shut off valve was overhauled and boxed up.

03 15 01 BHEL BOILER F-5111 INSPECTION :

(1) Boiler was inspected by Boiler inspector. Open test condition inspection on 23-05-97. Hydrotest at 90 Kg/cm2 pressure on 27-05-97. All three relief valves were overhauled. Relief valve tested on 7-6-97 and reading were as follows.

	Popping pressure in Kg/cm2	Reset pressure in Kg/cm2
Drum front R.V.	71.5	68.5
Drum Rear R.V.	69.0	66.0
Super Heater R.v.	65.0	63.0

- (2) Dampner of burner make free and greassing done.
- (3) All inspection window glasses of boiler furnace were cleaned and damaged glass were replaced.
- (4) Deareator inspection was done and found O.K. Its trays and support found intack.
- (5) All dampners were made free by greasing.

JOB CODE

JOB DESCRIPTION

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03 15 02 RAH OVERHAULING :

- (1) All hot end baskets (12 Sets) were installed with locking bar provided on frame to restrict the axial movement of hot end baskets. All cold end baskets : 12 Nos were also loaded with new ones. This was checked by M/s.BHEL and found satisfactory.
- (2) Radial seals both at cold end and hot end were provided new with following clearances.
  - i) Hot end inboard : 4.00 MM
  - ii) Hot end outboard : 0.00 MM
  - iii) Cold end inboard : 0.00 MM
  - iv) Hot end outboard : 4.00 MM

Note : All three joining areas (inboard outboard and middle) were provided with seal tabs to ensure no leakage from the joint.
- (3) Bypass / Circumferential seal on both hot end and cold end were fixed with new and clearances were fixed as below.
  - i) Hot end side : 2.00 MM
  - ii) Cold end side : 0.00 MM
  - iii) Seal elevation (H & G) : 20 MM (This is from the tip of the seals to the centre section of outer ring) Seal clearance chart (Annexure-A) is enclosed after filing the above clearance.
- (4) Soot blower - It was cleaned, gear boxes were topped up with fresh oil after flushing old oil. Flue gas side ducting also cleaned and nozzle tip of soot blower pipe found okay. Trial run was taken and soot blower working found okay.
- (5) Water washing nozzles on both hot and cold end were cleaned and checked and found satisfactory.
- (6) Trial run of the unit was taken for eight hours when boiler was in cold condition. Current rate of motor was shown in MCC (Motor control centre) 4.00 Amps which is well within limits. When boiler lit up, the same ampereage was observed with out any fluctuation observed.

*Officer Kadil*  
**SEAL CLEARANCE CHART - ANNEXURE - A**

HTR No 0566-

SIZE 1841.5 x 144

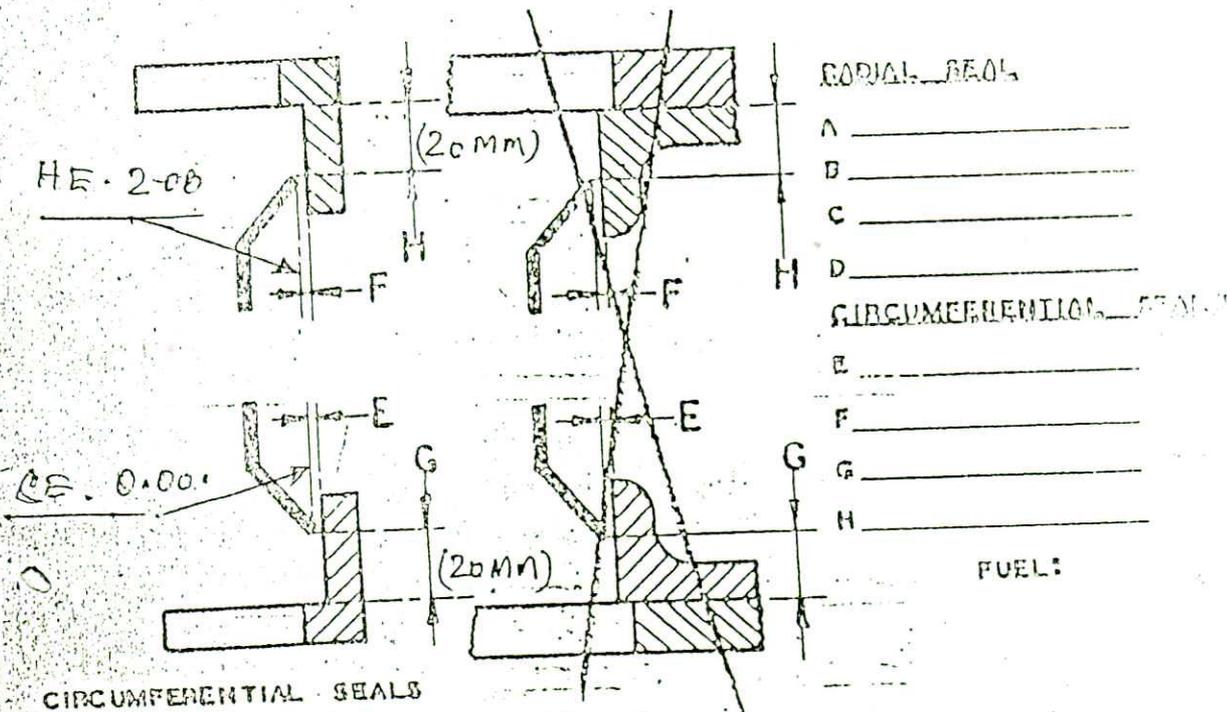
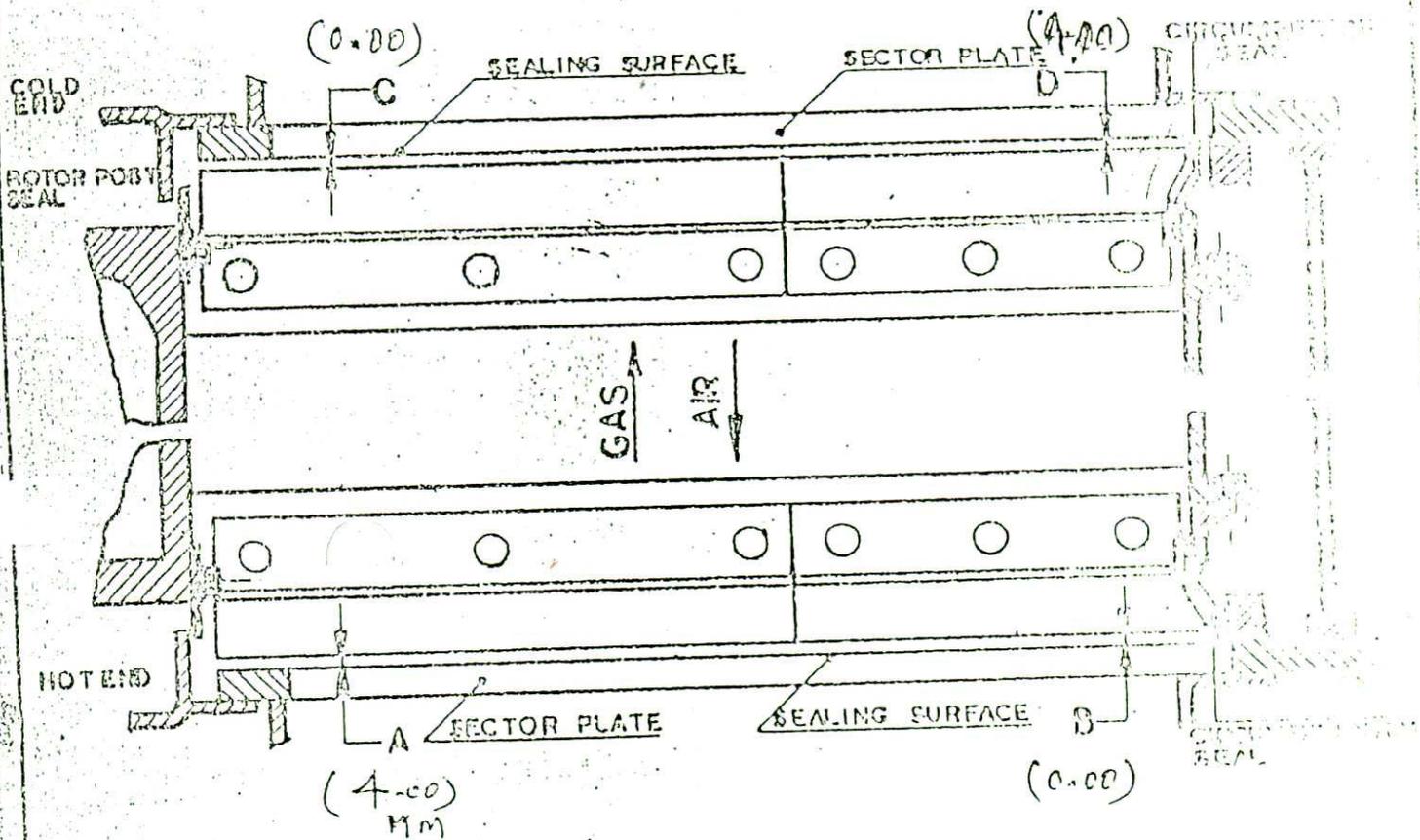
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*Rotor Seal*  
 HE - 10-3-79  
 OB - 0.00

*CE Rotor*  
 I.B. 0.00  
 OB. 3.97

*Bypass Seal*  
 HE - 1.98  
 CE - 0.00

*Seal 2 (Lined)*  
 HE - 19.05  
 CE - 19.05



*Phatanch*  
 7/6/97

*Bhargava*  
 8/6/97 Sr. Engr. B.N.R.

JOB CODE

JOB DESCRIPTION

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(7) During the trial run and boiler start up the following were also checked.

- i) Hot & cold end bearing oil level : Found okay
- ii) Cooling water circulation to bearing housing : Found okay
- iii) Level of main gear box oil and no abnormal heat or noise was observed : Found okay

(8) Recommendations :

- i) Ensure required oil level in all gear box & bearings.
- ii) Clean thoroughly the baskets & duct when there is an opportunity.
- iii) Seal clearances to be checked and maintained as per specifications (See Annexure-A).
- iv) Provision of all seal tabs on radial seal to be ensured during checking of RAH unit. This is important.
- v) All hot end baskets are to be put in their compartment loose and there is no need of arresting the movement of baskets either by welding, putting wedge or bolting. This is essential to take care of the basket expansions during running.

The above jobs were carried out satisfactorily with best of our knowledge.

03 15 03 BHEL BOILER SOOT BLOWERS K-5112 1 TO 6 & LRB 1 & 2 :

Rotary soot blowers :

Gland packing changed and steam inlet valve overhauled.

L.R.B 1 & 2 :

- Lance tube was found open at blind end.
- Inner tube was found bend by 4 - 5 MM at centre
- Steam leakage found from travelling carrying assly.
- Lanse assly was replaced with new one.
- Inner tube was streighten in work shops.
- Complete traveling carriage assly was replaced with new one.
- All chains cleaned and greasing done.
- Steam inlet valve overhauled

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03 17 01    COOLING WATER DISTRIBUTION VALVES ON DUCT-OVERHAUL :

1.    Cooling Tower (Ammonia) top distribution valves are overhauled.
2.    Cooling Tower (Urea) top distribution valves are overhauled.

03 17 02    VALVES REPAIR / REPLACEMENT :

1.    Old boiler feed water interconnection valve and its bypass valve attended.
2.    Old boiler feed water control valve , isolation valve and its bypass valve gland leaks attended.
3.    Old boiler attemperator control valve isolation and bypass valves glands leak attended.
4.    FD Fan turbine exhaust line NRV is attended.
5.    60 ata steam line NRV cap leak attended.
6.    The cooling water pumps discharged lines pressure gauge isolation valves are replaced (total 6 Nos.)
7.    All cooling water pumps casing priming valves are replaced.
8.    Cooling water isolation valve to Q-4401/B lube oil cooler inlet is replaced for in operativeness.
9.    The safety valves of Q-4401/B & Q-4403 turbine exhaust lines are overhauled.
10.    Q-4403 exhaust 4 ata isolation valve replaced.
11.    40 ata steam utility side batter limits isolation valve bonnet and gland leaks are attended.
12.    Instrument air header for old IG vaporiser and combustion chamber main isolation valve is attended.

03 20 01    FABRICATION JOBS :

1.    Old boiler DM water to old deaerator is disconnected and removed.
2.    HDPE Effluent segregation line of Anion units was removed and a new S.S. 12" NB Header made and installed.

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3. Urea side return header from urea battery limits to return header riser including underground area was inspected for thickness & found okay.
4. Ammonia side cooling water return header on the deck of cooling tower for all six cells on both sides i.e. Admn. and Ammonia plant side was replaced by new distribution header with 3 MM thick S.S. patch plate 3 Meter long under all distribution valves and suitable 3 MM thick S.S. patch plate under all supports was provided.
5. 36" size cooling water Return line going from underground to the top of Ammonia cooling water cell (Admn. side) 4 meter piece partly underground upto chamber was replaced as thickness was found 3.4 MM against 6 MM design thickness by a 10 MM thick C.S. pipe. A patch plate of 1 Mtr. long was also provided where the pipe comes out at ground level.
6. Raw water header in D.M. plant feeding raw water to all cations was lifted from ground level to a height of one meter in order to ease in carrying out painting and other maintenance work.

03 31 01 CONTRACT JOBS :

1. Flue gas stack painting done.
2. Degasser tank rubber lining is checked and found okay and rubber repairing was needed to be done.

## PLANT TURNAROUND - MAY - JUNE - 1997

## OFFSITE &amp; UTILITY PLANT

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## INSPECTION SECTION

JOB CODE      JOB DESCRIPTION

03 41 01    BHEL BOILER (GT-2068) :

Visual inspection and ultrasonic thickness measurement of Steam Drum, Mud drum, furnace tubes; Insitu Metallography work on Steam drum and Mud drum were carried out.

The following observations were made on each equipment:

**(1) STEAM DRUM :**

- (a) In general, the shell had assumed blackish brown colouration on the inside surface of the shell.
- (b) All the internals and fittings of the steam drum were found intact in position.
- (c) The weld joints of the shell and the dished ends were found free from any surface defects during visual inspection.
- (d) No corrosion/erosion was observed on the stub ends of the water wall and down comer tubes inside the drum.

The overall condition of the steam drum was found satisfactory. The ultrasonic thickness measurement revealed min. thickness of shell= 101.2 mm against the design thickness of 97.0 mm. For dished ends, min. thickness was observed to be 79.7 mm on West side dished end whereas 79.5 mm for East side dished end against the design thickness of 77.0 mm. (Min. required thickness at knuckle radius is 72.0 mm as per drawing). The detailed report on thickness measurement is attached herewith at Annexure-1.

Insitu metallography was carried out by the PDIL team on the Steam Drum shell. The microstructure was found to be sound and no abnormalities were reported.

**(2) MUD DRUM :**

- (a) Blackish brown colouration was observed on the shell internal surface.
- (b) No corrosion/pitting was observed on the shell surface.

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(c) The weld joints of the shell and shell to dished end were found free from any signs of corrosion and service defects under visual inspection.

(d) All the protruding ends of the water wall/baffle tubes were visually examined from inside and no defects were observed.

(e) One no. clamp of the phosphate dosing line was found loose which was tightened before boxing up the drum manholes.

The overall condition of the drum was found satisfactory. Ultrasonic thickness measurement was carried out. Minimum thickness on shell was found to be 82.0 mm against the design thickness of 78.0 mm. On West side dished end and east side dished end, min. thickness was found to be 57.0 mm and 57.6 mm respectively against the design thickness of 57.0 mm. (Min. required thickness at the knuckle radius is 54.0 mm as per drawing.) The detailed report on thickness measurement is attached herewith at Annexure-2.

Insitu Metallography was carried out on the drum shell. The microstructure was found to be sound and no abnormalities were reported by the metallography team of M/S. PDIL, Sindri who performed the test.

(3) Ultrasonic thickness measurement of Side wall tubes, Bank tubes, Baffle wall tubes, Stage-I Primary Superheater tubes, Stage-II Secondary Superheater tubes, D-Panel tubes, Cut Corner tubes, Front wall tubes and the Rear wall tubes was carried out. The summary of the minimum thickness observed is given below for reference. The detailed report on thickness measurement is attached herewith at Annexure-3.

Sr. No.	Tube Details	Design Thick. in MM	Min. thk observed in MM	Remarks
1.	Furnace Side Wall tubes	4.5	4.5	--
2.	Bank Tubes	3.6	3.6	--
3.	Baffle Wall Tubes	4.5	4.3	4.4 % reduction in thickness. Acceptable.
4.	'D' Panel tubes	4.5	4.6	--

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Sr. No.	Tube Details	Design Thick. in MM	Min. thk observed in MM	Remarks
5.	Cut Corner Tubes	3.2	4.8	--
6.	Front Wall Tubes	4.5	4.7	--
7.	Rear Wall tubes	4.5	4.8	--
8.	Stage-I Superheater tubes	7.1	6.3	11.3% reduction in thickness. Acceptable.
9.	Stage-II Superheater tubes	5.6	5.2	7.1% reduction in thickness. Acceptable.

03 41 02 NAPHTHA STORAGE TANKS T-3301 A AND B:

In both the tanks, additional nozzles of 12" size-two nos; 6" size-two nos and 3" size-one no. were provided. In tank T-3301- A, the work was carried out by M/S. L&T whereas the same was carried out departmentally by Workshop/Maint. group in Naphtha tank-B. Dye Penetrant test after root run, after backchipping from inside of the tank, after complete welding from inside and outside and finally after welding of the reinforcement pads was carried out. Required rectifications were done by grinding and rewelding and finally all the nozzles weld joints were cleared in DP test.

In view of the repairs done on the weld joints of the nozzles provided in Naphtha tank T-3301B, air and soap solution test was carried out by pressurising air through the tell-tale holes of the reinforcement pads at 1.0 Kg/Sq.CM pressure. Leakage was detected in 12" NB nozzle of this tank which was rectified by grinding and rewelding followed by DP test and confirmatory air and soap solution test. Ultrasonic thickness measurement of the bottom plates of Naphtha Tank T-3301 A was carried out. Minimum thickness was found to be 9.4 mm against the design thickness of 10.0 mm. The detailed report of thickness measurement is enclosed herewith at Annexure-4.

The weld joints of the bottom plates of both the tanks were found covered with dry sticky sludge which was removed to the maximum extent by sand blasting before carrying out the visual inspection. Scattered pittings of 0.5 mm to 1.0 mm depth were observed on the bottom plates. Internal painting was carried out in Naphtha Tank-A during this shutdown. Thickness measurement of the dry film of the paint was carried out after applying Primer and also during each application of the two coats.

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03 41 03      COOLING WATER RETURN HEADER AMMONIA PLANT INTER MIXING "I" FABRICATION INSPECTION :

On Ammonia cooling tower CW return header, an intermixing 'I' headers were installed on East as well as West side by Technical Deptt. through M/S. J.M.Engineers,Ahmedabad. The return water line from Ammonia plant to Cooling Tower(H-4401-1to6) is of 36" size whereas the same is of 24" size for Cooling Tower (H-4401/7&8). The inter mixing 'I' header was prefabricated and was installed at site during this shutdown for the purpose of mixing of return hot water before reaching the distribution headers of both the Cooling towers of Ammonia Plant.  
D.P.test was carried out at the following stages:

- (1) On the Edge preparation on 36" and 24" NB lines after cutting and grinding
- (2) After root run welding
- (3) After complete wedling of the pipe and 'I' header nozzles
- (4) After welding of reinforcement pads around the nozzles on 'I' headers.

Necessary rectifications were made based on the observations during DP test at each stage of inspection. On East side, 36" CW return header segment was replaced during this shutdown below th mixing 'I' header upto appx. 1.5 Meter depth as heavy corrosion was observed on the outer surface of the pipe.

03 41 04      THE DISTRIBUTION HEADERS OF AMMONIA PLANT :

The distribution headers of Ammonia plant Cooling Towers were replaced during this shutdown through M/S. Technocon,Baroda. Inspection of the raw materials i.e. plates etc. was carried out at the party's works before commencing fabrication. The prefabricated pipe segments were taken to the position and were welded at site. Total 34 nos. of circumferential weld joints and 32 nos. longitudinal seams each of the East side and west side distribution headers were DP tested after root run as well as after inal welding. The welding of the reinforcement pads,supporting pads etc. were also checked by DP test after final welding.

03 41 05      FABRICATION OF H.P.AIR LINE :

Fabrication of HP air line from Ammonia plant to IG plant was carried out during this shutdown by Offsites Maint. group through M/S. Duggal engrs.The tapping was taken from Air Compressor discharge line. All the weld joints were DP tested after root welding as well as final welding. Spot radiography (10 %) was carried out on selected joints to ensure proper welding quality.

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03 41 06 ULTRASONIC THICKNESS MEASUREMENT :

Ultrasonic thickness measurement was carried out on various pipe lines as given below:

Sr. No.	Line Description	Design thick. MM	Min.thk observed MM	%ge red.	Remarks
1.	Naphtha line from Naptha pump disch. to Ammonia plant	5.49	5.10	5.9	---
2.	Ammonia line from Ammonia plant to ammonia storage tank	6.02	5.7	7.19	---
3.	36"NB CW return header of Ammonia cooling tower on East side above & below Inter mixing header	7.94	3.0	62.2	Replacement recommended.
4.	24"NB CW return header of Ammonia Cooling Tower on East side above and below Inter mixing header	9.53	8.2	13.9	---
5.	36"NB CW return header of Ammonia Cooling Tower on West side above & below Inter mixing header	7.94	2.5	68.5	Replacement recommended
6.	24"NB CW return header of Ammonia Cooling Tower on West side above and below Inter mixing header	9.53	7.5	21.3	---

The ultrasonic thickness measurement report of the Cooling water return headers are enclosed herewith at Annexure-5.

( DETAIL INSPECTION REPORT CAN BE SEEN IN INSPECTION SECTION WITH ALL ANNEXURES )

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OFFSITE & UTILITY PLANT

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CIVIL JOBS

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<u>JOB CODE</u>	<u>JOB DESCRIPTION</u>
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03 51 01 CIVIL JOBS :

(A) COOLING TOWER AREA :

1. C.W.Return line open for inspection by excavation and dismantling concrete on Urea side and on Ammonia side.
2. Covering of cooling water channel and sump No.1,2,3 and 4 by providing R.C.C.slab and beam.
3. Widening channel connection between cooling tower No.1 & 8 by making new channel so as to have sufficient flow of water.
4. Removing and Re-fixing of A.c.sheeting, clading and louvers.

(B) WATER TREATMENT PLANT

1. FRP lining on side and bottom of strong effluent drain.
2. Acid proof brick lining on side of HCl Storage tank and floor for H2SO4 tank.
3. FRP lining work in Weak effluent channel.

(C) EFFLUENT TANK

1. Acid / Alkali proof brick lining work in Strong effluent pit "A" & "B" by M/s.Chemisight Engineers.

(D) S.G.PLANT

1. Refractory lining work on side of burner and combustion area of S.G.Plant.
2. Refractory lining work in Super heater area.
3. Manhole opening and closing.

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OFFSITE & UTILITY PLANT

ELECTRICAL JOBS

JOB CODE	JOB DESCRIPTION
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03 61 01 UTILITIES ELECTRICAL JOBS :

1. Preventive maintenance carried out on following transformers.  
TR-1A, 1B, 2A,2B,3A,3B,8,11,12,13,14
  - a) Inspected primary and secondary cable boxes, end terminations, checked and tightend of connections.
  - b) Tested oil in marshalling boxes on primary and secondary transformers and cleaned chamber and replaced oil.
  - c) Replaced of silicagel in dehydrating breather of above transformer
  - d) Checked trip alarm circuit and cleaned all emergency trip boxes.
  - e) Checked IR value of primary and secondary windings of above transformers.
2. Inspection and servicing job were carried out of CTR make OLTC.
3. Inspection and servicing job were carried out of HHE make 'V' type OLTC.
4.
  - a) Checked earth resistance of all earthing installations at 66 KV Switch yard.
  - b) Checked for alignment of all isolators for proper opening and closing.
5. Preventive maintenance of alternator and AMF set and its control panel were carried out.
6. Preventive maintenance of TMG/Siemens make LT ACBs installed at MCCs were carried out and replaced damaged parts and worn out contacts.
7. Indicating lamps of breaker pannel were replaced.
8. Preventive maintenance carried out on all feeder compartment mounted on the following MCCs :  
MCC-1, MCC-2, MCC-2A, MCC-2B/2E, MCC-2F, MCC-8, MCC-11, MCC-12, MCC-13.

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JOB CODE	JOB DESCRIPTION
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779

9. Tested all type of relays installed in the above MCCs.
10. Maintenance job carried out of all lighting distribution boards and replaced defective and burnt out fuse fittings.
11. Overhauling of P-4203 motor was carried out.
12. Checked terminal boxes for loose connections and burnt cables of all motors above 20 hp.
13. Preventive maintenance carried out of 11 Kv. switchgear Jyoti/GEC/TMG/Kirlosker installed at 66 KV Substation and MPSS for cleaning, inspection, tightening of bus bars and defective parts were replaced.
14. Oil was replaced in Kirloskar and GEC breaker. Indicating lamps of above breaker pannel were replaced.

**03 61 02 OFFSITES ELECTRICAL JOBS :**

1. Preventive maintenance carried out on following transformers TR-4A, TR-4B for
  - a) Inspected primary and secondary cable boxes, end terminations, checked and tightend connections.
  - b) Tested oil in marshalling boxes on primary and secondary transformers.
  - c) Replaced of silicagel in dehydrating breather of above transformer.
  - d) Checked trip alarm circuit and cleaned all emergency trip boxes.
  - e) Checked IR value of primary and secondary windings of above transformers.
2. Preventive maintenance carried out of TMG/Siemens make LT ACBs installed at MCCs and replaced of damaged parts and worn out contacts.
3. Indicating lamps of breaker pannel were replaced.
4. Preventive maintenance carried out on all feeder compartment mounted on the following MCC-3.
5. Tested all type of relays installed in the above MCC.
6. Maintenance job carried out of all lighting distribution boards and replaced defective and burnt fuse fittings.
7. Checked terminal boxes for loose connections and burnt cables etc. of all motors above 20 hp.

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OFFSITE & UTILITY PLANT

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INSTRUMENT JOBS

JOB CODE	JOB DESCRIPTION
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03 71 01 NEW BOILER :

CONTROL ROOM PANEL INSTRUMENT

Overhauling and Calibration of following Receivers, Recorders & Controllers. (cleaning of Flapper Nozzle, restriction, Orifice and Supply ports.

- A) FR-3 / FR-4 (STEAM TO TURBINE SPRAY WATER FLOW)
- B) TRC-4 (DESUPER HEATER OUTLET TEMPERATURE)
- C) TRC-5 (OUTLET STEAM TEMPERATURE)
- D) FRC-11/PR-15 (AIR FLOW / FURNACE FLOW)
- E) LRC-2/FR-1 (DRUM LEVEL / FEED FLOW)
- F) PR-1/PR-2 (FEED WATER PRESSURE BEFORE AND AFTER 100% CONTROL VALVE)
- G) LRC-3 (BLOW DOWN TANK LEVEL)
- H) FRC-1/FR-2 (FEED CONTROLLER / STEAM FLOW)
- I) FRC-21/FR-22 (FUEL OIL / GAS FLOW)
- J) 40 ata STEAM PRESSURE / RAW WATER TANK LEVEL RECORDER
- K) SERVICING AND CALIBRATION OF ALL RECEIVER GUAGES OF CONTROL ROOM PANEL
- L) CONTROL ROOM REGULATOR OVERHAULING AND CLEANING
- M) CHECKED CALIBRATION OF TEMPERATURE INDICATOR TRC-5, TI-14, TR-15, TR-13, TIA-6 CHINO RECORDER TI-16, TI-21, TI-11 & 12.
- N) CHECKED E/P CALIBRATION TRC-4, TRC-5

CONTROLLERS :

Cleaned Orifice, Flapper nozzle and Pilot and checked Synchronization and replaced 'o' ring of cascade and auto-manual switch.

- 1) TRC-4 ,      2)TRC-5 ,      3)LRC-3/LRC-4 ,      4)FRC-1
- 5)FRC-11      6)FRC-21      7)LRC-2

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- 8) 40ata Steam pressure controller (Replaced reset unit.)
- 9) PRC-5 (STEAM HEADER PRESSURE CONTROLLER)
- 10) Deareator Pressure Controller

In following Instruments Seal leak checked carried out.

- 1) FRC-21, 2) FRC-11 3) TRC-5, 4) FRC-1, 5) LRC-2, 6) PRC-5.

CONTROL VALVES :

- 1) HOHTV (HEAVY OIL HEADER TRIP VALVE)

Fixed new diaphragm for testing purpose it was found ok. so refixed the original diaphragm.

- 2) CCV-21 (OIL CONTROL VALVE)

Opened the diaphragm for Inspection purpose. Itn was found in good condition so refixed it and checked the valve operation.

- 3) BTV-1

Valve was dropped from line it is completely overhauled and replaced micro switch with new one. Fixed back and checked the operation from control room it was found ok. Replaced Solenoid valve for BTV-1

4) Following control valves and air regulators was serviced.

Folowing BTV Valve checking and Overhauling and all BTV Limit Switch checked.

- a) BTV No. 1-1 , 1-2 , 1-3 & BTV No. 2-1 , 2-2 , 2-3
- b) Manual Valve's Limit Switch checked.

- 1) CCV-2    2) GHTV    3) IGTV

5) Cleaning and stroke checking of the following control valves.

- 1) BTV-2    2) PCV-2    3) LRC-4    4) PRC-50    5) 30 % BFW CONTROL VALVE    6) PCV-1    7) TCV-1    8) TCV-2    9) PCV-2    10) PICA-114 ATA STEAM PRESSURE,    11) Boiler feed water by-pass control valve stroke checked,    12) Deareator over flow control valve overhauling and checked its stroke

JOB CODE                      JOB DESCRIPTION

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6) 100 % CONTROL VALVE (BFW) :

Actuator cylinder was replaced with new one by Valtek service engineer. rest of the actuator part was serviced, seal kit replaced seat and plug by new one above job was done by and under guide line by Valtek service engineer. Replaced Valtek Valve Positioner

7) OIL TEMPERATURE CONTROL VALVE (TCV)

Hydraulic test upto 50 Kg /cm<sup>2</sup> was done for checking body leak then taken for fine machining cut on seat and plug changed the diaphragm as it was found punctured Assembled the control valve and also checked the control loop and fixed it back it was found ok.

UPSS SYSTEM:

Service of the UPS by Keltron Engineer.

Following points were checked.

1) waveform of charger section of PCB terminal point.

a) Power supply +/- 12vdc

b) R-Amp B-Amp Y-Amp (No connection inside) sawtooth waveform

c) Firing pulse of thyristor R Y B pulse

d) Pulseuating DC voltage of charger bridge voltage output waveform of thyristor conduction

e) After firing DC voltage 110 V and ripple voltage (AC)

f) Checked battery reliability by "Switching ON and OFF", ON - OFF of charger for 25 minutes set the current limits of "charger to battery current" by current limit potentiometer (Approximately 40 Amp)

g) checked static switch

h) checked/measured battery voltage.

TRANSMITTERS:

Checked calibration of field transmitter.

1) PIC-22 reduced span from 7Kg/cm<sup>2</sup> to 3.5 Kg/cm<sup>2</sup>.

2) FT - 1 , 3) FT - 2 , 4) STEAM FLOW , 5) FT - 4

6) SPRAY WATER FLOW , 7) FT - 13, 8) FUEL GAS FLOW  
0-25

JOB CODE                      JOB DESCRIPTION

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- 9) STEAM FLOW TO F.D. FAN
- 10) FI - STEAM FLOW TO BFW PUMP
- 11) FT - 11 COMBINED AIR FLOW
- 12) FT - 21 FUEL OIL FLOW, 13) DPT - 1
- 14) DIFFREENTIAL PRESSURE ACROSS AIR HEATER
- 15) DPT - 14 DIFFERENTIAL PRESSURE WIND BOX
- 16) PT - 21      17) PT - 22      18) PT - 3      19) PT - 4,5
- 20) PT -6 21) PT - 7      22) PT - 25      23) PT - 15
- 24) LT-1 Transmitter replaced by 392 TD Taylor Transmitter.

SWITCHES:

PRESSURE SWITCHES, LEVEL SWITCH & RECEIVER SWITCHES

Following Pressure switches, Receiver switches & Level switches calibration checked.

#LSL-1 (DRUM LEVEL EXTRA LOW LEVEL SWITCH)

Checked switch operation by filling and draining water and replaced the terminal strip in both the switches

#RECEIVER SWITCH :

- 1) PSL-7, 2) PSL-2 , 3) LAL-3 , 4) PSL-6 , 5) PSL-8,
- 6) FSL-5111 7) FSL-11 , 8) PAL-4 ,9) FSL-2 ,10) PSL-11
- & PSH-12,11) PSL-28 12) PSL-29 13) PAL-22 14) PAL-23

IGNITORS:

Checking and cleaning of Ignitor Gun and Spark Plug and also cleaning of Gas Solenoid valve of Ignitor of both burner No. 1 & 2.

DAMPERS:

All dampers cleaning and overhauling and checked operation of following dampers

- a) FD fan inlet damper and its valve positioner
- b) FD fan outlet
- c) Air heater inlet damper (provided new Scharder Sol. valve)
- d) Air heater outlet damper
- e) both fuel air damper and its valve positioner.

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JOB DESCRIPTION

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EYE-HYE (FOR DRUM LEVEL):

Checked terminals of eye-hye electrodes and replaced three nos. of lugs as old lugs were found corroded.

TEMPERATURE INDICATOR:

BFW motor bearing temperature indicator calibrated and shifted to convenient location.

F.D. FAN:

Removed all instruments from FD fan for Mech. Maint. purpose and after completion of all the jobs all the instruments were fixed back. (all TI & PI calibration checked. Provided new receiver gauge on FD fan Governor

JUNCTION BOXES :

Painting of Electrical Junction boxes in Field. All Electrical Junction boxes terminal tightening and cleaning of wire

PRESSURE GAUGES:Calibration of Pressure Gauges

- a) PI- 2 , b) PI - 3 , c) PI - 4 , d) PI - 5, e) PI-1
- f) 14 ATA STEAM PRESSURE
- g) checked calibration of BFW discharge Pressure gauge.

O<sub>2</sub> ANALYSER

Sample line flushed by 7Kg/cm<sup>2</sup> air and Sensor filter cleaned with air.

CALIBRATION OF FIELD CONTROLLER

Cleaning and checked synchronisation of following controllers.

- a) Oil Heater temperature controller
- b) DPC-1 furnace pressure (fuel oil damper)
- c) blow down tank controller
- d) PIC-1 & PIC-2
- e) TIC-1
- f) Oil pressure controller.

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03 71 02    NH3 STORAGE AREA:

calibration of field transmitter and controllers.

- 1) PT-3002    2) PT-3009    3) PT-3008 Pneumatic
- 4) PT-3008 Electronic    5) PIC-3008 (440 R CONTROLLER)
- 6) PT-3103                      7) PIC-3103(RECEIVER CONTROLLER)
- 8) LT-3002    9) LT-3003    10) FL-3050 A/B    11)PT-3008

Checked Pressure Switches and Level Switches

- 1) PSL-3053A/3053B, PALL-3004, PAL-3055A, PAL-3006, PSHH-3007.
- 2) K-3001A Suction Pressure Switch (Provided new switch) PSH-3063A, PAL3067A, PSH-3063B, PAL3057B, FSL 3050A/B.
- 3) Replaced Storage Tank Pressure switch with new one.
- 4) All pressure switch cleaning and checking of BFW Pump.

Panel and panel instruments

Cleaned with the help of blower and replaced battery for SLPC controllers. Calibration Checked of TR-3001 & TR-3002 Temperature recorder.

K-3001- field junction box

Terminal strip replaced with new one and all junction boxes cleaning and tighten all the connection.

Cleaning and Calibration checked of the following Level

Transmitter ( V- AUTOMATE )

- 1) LIC- 3051 A/B, 2) LIC- 3053 A/B ,3) LIC- 3055 A/B,
- 4) LIC- 3058 A/B
- 5) Checked controller calibration of PIC- 3009

CONTROL VALVES:

- 1) PICV- 3103 Tank Pressure C/V serviced and checked its stroke.
- 2) Provided THI and Thermowell in ne Naptha Pump. (Thermowell hydraulic tested at 10Kg/cm<sup>2</sup>)
- 3) All control valves of compressor A & B were cleaned and overhauling and checked all control valve stroke.
- 4) PCV- 3008 C/V cleaning & Greasing & also checked micro switch performance for opening and closing.

JOB CODE

JOB DESCRIPTION

286

03 71 03 OLD BOILER NO.2:

Frequent Tripping of Boiler & Checking of Trip system:-

Oil Shut off valve Solenoid valve was remaining countinously energised Found wrong connection of solenoid wire IB 23 to terminal 26. So connected it to terminal no 23 now operation is ok. Local panel Power supply fuse was blowing frequently. Disconnected the cable coming from Drum Level Switches. This reduced the problem of frequent fuse blowing. Both the cables were checked and found burnt on level switch end so replaced the cables from level switch to local panel. New cables were also found ground after giving some service. So provided junction boxes at some distance away from level switch. From junction box to level switch Silicon wire were laid. Checked both the cables with Meger and were found o.k. Still sometimes 110V power supply fuse of local p[anel was blowing after some intrevals, Provided independent 2 Amp Fuse for each burner. Still sometimes 110V power supply fuse was blowing but individual burner fuse were not blowing.

Removed folowing cables from Local panel Terminal Strip

- 1) Low Air Pressure Wire No. 11
- 2) Low Oil Temperature Wire No.12
- 3) Low Automising Steam Pressure Wire NO. 13.

Connected jumper in place of Switch wire no. 12 contact.

Also removed wire NO. 18 which is going to control room for low gas Switch.

Connected Jumper in place of wire No. 18 fuse blowing is to be observed.

Replaced Solenoid 5 & 6 of burner No. 2 by repaired ones and checked performance of both the burners & found o.k.

Still sometimes fuse blowing of 110V power supply of local panel persisted.

Removed following wires from local control Panels and provided jumper in their place (FT - 2 , FT - 3 ) Now only local panel is operatable.

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JOB DESCRIPTION

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Disconnected Neutral wires of following Alarm Cables.

- 1) Low oil pressure
- 2) Low automising Steam temperature Gas control valve low pressure switch Also removed bulbs from control panel of control room.

" Purge air flow normal " wire No. 15 checked with Megger found ok so reconnected back.

Replaced all the relays of Burner No. 2 & later removed as original found good.

During short power time power failure checked all red wires of phase and black wires with megger. One red wire was found grounded so removed it.

Now the Boiler was running without fuse blowing incidents.

Removed all additional fuses provided earlier.

In test conditions following alarm were not coming

- 1) oil pressuer low
- 2) Drum extra low level wire 24 & 27 in local panel were found disconnected. Provided jumper on 24 & FT - 37, & 27 & 32.

All shut off valves of Oil and Gas operations checked. Their Limit switches connections and operations were also checked.

- 1) Steam flow transmitter FR1B.:- Overhauled air supply regulator & replaced base plate and nozzle Baffle Assembly of Transmitter and calibrated it 0 to 650 inches of H<sub>2</sub>O.

- 2) Calibrationr feed water flow Transmitter and controller.

Impulse line of transmitter replaced.

- 3) Checked Calibration of FS - 2B.

- 4) FR - 3B filled Glycol.

- 5) FR - 5B indication was suspected checked and calibrated square root extractor.

- 6) Conductivity meter cell impulse line replaced.

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- 7) Final steam temperature cable was traced & connected to I/P convertor, Calibrated I/P convertor.
- 8) F.D. Fan Turbine Lube Oil Pressure alarm appeared frequently. Checked its cable and found that it was grounded so replaced the cable.
- 9) Provided Desuperheater Duplex Thermocouple.
- 10) PICV- 5151 Cleaning & overhauling of control valve Positioner and checked stroke of control valve.
- 11) Ignitor 2 gas line fitting line was broken in body extracted & replaced it.

**03 71 04 COOLING TOWER AREA :**

Over hauling and calibrated the following transmitters.

- 1) Basin Level Transmitter
- 2) Raw water tank level transmitter
- 3) Checked Tachometer of q-4401 b & q-4403 and also checked wire connection in junction boxes.
- 4) Checked calibration of all the Pressure Gauges and Temperature indicators (THI) for the new pump also.
- 5) Checked stroke of PICV - 5153.

**03 71 05 CHROMATE PLANT:**

- 1) To clean the Orifice Flapper nozzle and calibrated receiver recorders.
- 2) Combined pH receiver recorder.
- 3) Forbes Marshal Service technician replaced both the PCB of Conductivity Tx of combined Effeleunts Conducttivity meter and it was working satisfactorily.
- 4) Overhauling and caslibrated Transmitters
  - a) Weak Effeleunts Tx.
  - b) Strong Effeleunts Tx.

JOB CODE                      JOB DESCRIPTION 189

03 71 06 D.M. PLANT:

Cleaned Orifice and Flapper nozzle and calibrated following receiver recorders and controllers.

- a) M-1 Tank level recorder
- b) SMB-4 / Cation-5 flow recorder
- c) DM-1 flow recorder / C.T. make up flow recorder
- d) Raw water to D.M. water flow / D.M. flow recorder
- e) D.M.-3 flow recorder
- f) D.M. water / NH4OH tank level / NAOH flow recorder
- g) D.M. tank level /D.M.-4 flow recorder
- h) Overhauling two Nos. of air regulator Two Nos. of Pneumatic junction boxes were replaced by new one (location near Anion - 4)

Cleaned flapper nozzle, relay of following Tx and checked Calibration.

Cation - 1,2,3,4,5

DM - 1,2,3,4,5 FT - 34

PMB - 4 DM flow FT - 44

SMB - 4 DM water flow

FT - 53 Cation regeneration flow

FT - 1 Raw water to DM Plant.

FT - 2 FT - 3

Boiler feed water make up, DM water flow  
for NAOH flow

ANION - 5 ,                      NH4OH flow , FT - 51

DM Water flow for NH4OH preparation , Drinking water  
flow

FT - 52 NH3 flow for NH4OH preparation, Steam flow to  
Turbine

Dilution water flow Q - 4401A /  
Q -4401B  
CHECKED.

Raw water to cooling Tower 0-32

JOB CODE

JOB DESCRIPTION

190

FIELD RECEIVER GAUGES AND RECEIVER CONTROLLERS

Overhauled and checked calibration of following field  
Tx.LT - 4102 CT make up

De Cation water

HCL measuring tank M-1 level Tx

HCL loading / Unloading Tx

LIC 4104 Degaser receiver Controller

Raw water to inlet flow

# Transmitter and transmitter mounting frame got  
painted.

# checking Anion outlet Butterfly valve

# checked following control valves and also checked C/V  
stroke.

# Anion 1,2,3,4,5

# 24 Nos. of pressure gauges painted with black colour

# Regeneration of water flow transmitter location  
changed as per requirement of P/P.

# Cleaning of all conductivity cells and also provided  
lug on cell terminals.

PLANT TURNAROUND - MAY - JUNE 1997OFFSITE PLANT

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TECHNICAL DEPARTMENT JOBS

JOB CODE                      JOB DESCRIPTION

03 81 01 TECHNICAL DEPTT. JOBS :

- 1) Intermixing of Return cooling water from old and new circuit of Ammonia plant.

Modification in C.W.Return headers for minimise the heat load by intermixing of cooling water.

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B & MH PLANT

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MECHANICAL JOBS

JOB CODE	JOB DESCRIPTION
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04 02 01 AMMONIA LOADING PUMP P-3102/A

PREVENTIVE MAINTENANCE

- 01) Dura Mechanical seal replaced.
- 02) Bearing No.SKF-7318-B Replaced.
- 03) Grease Coller Replaced.
- 04) Seal Housing Bush Replaced.

04 03 01 RECLAIM MACHINE M-2116 OVERHAUL :

- 01) Overhauled Main gear drive assembly by replacing main drive shaft, Needle Roller bearings, Bearing housing drive pinion, Drive sprocket, Right hand side cover and duplex chain assembly.
- 02) Replaced the New gear box of Boom hoist system.
- 03) Replaced All coupling bushes.
- 04) Attended the alignment of all flexible couplings.
- 05) Replaced the oil seals of link conveyor gear box.
- 06) Attended the foundation of Reclaimer drive lower gear box for proper fixing.
- 07) Tightened the king port middle flange bolts and nuts.
- 08) Replaced the damaged scraper blade.
- 09) Complete painting done,
- 10) Replaced the oil of all gear boxes.
- 11) Lubricated all the grease points.

04 03 02 PACKER SCALES OVERHAUL :

- 01) Attended the Packer Scale No.2,4 and 8 for replacement of coarse fine feed gate assembly and proper alignment.
- 02) Attended the servicing of stitching head stand of wooden slats, bearing replacement and greasing.

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- 03) Attended all 6 Nos Slat conveyor gear boxes for coupling bush replacement and oil refilling.
- 04) Attended all 6 nos Slat conveyor gear boxes for coupling bush replacement and oil refiling.
- 05) Complete painting done in all 6 Nos Slat conveyor structure, hoppers and packer scales.

04 19 01 NAPHTHA TANK T-3301 A/B JOBS :

- 01) Attended the New Nozzles fixing job of Naphtha Tank A & B as per drawing.  
  
Tank T-3301/B taken in Line and Tank T-3301/A job is in progress.
- 02) Removed and replaced the damage foam seal and rubber of Naphtha tank T-3301/B whereas replacement of foam seal and complete inside painting of Naphtha tank T-3301/A is in progress.
- 03) Dismantled and refixed chocked drain line and Naphtha Tank T-3301 A/B after cleaning.
- 04) Attended Ball valves for free operating of Jammed Ball valves of Naphtha tank T-3301 A/B.

04 21 01 CONVEYOR NO. M-2112 :

Replaced 600 MM wide Belt conveyor of 310 Meter long.

04 21 02 TRIPPER M-2123 OF CONVEYOR NO.M-2122 :

Replaced 4 Nos New cast steel wheels of Tripper M-2123.

04 21 03 CHUTE NO.7 :

Replaced old 7 Nos chute back in position.

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B & MH PLANT

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CIVIL JOBS

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JOB CODE                      JOB DESCRIPTION  
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04 51 01 CIVIL JOBS :

1. Epoxy painting on Ceiling of Bagging floor , Hopper floor, R.C.C. Columns, Beams at ground floor, 1st floor and hopper floor by APCODOER - 695 "E" Coats System.
2. Epoxy Monolithick plaster 5 MM thickn on floor of Bagging plant and 3 MM thick on side and bottom of slab of packer scale floor by CIBA GEIGY farmulation.
3. Acid / Alkai proof brick lining on side of conveyor gantry 2122.
4. FRP lining on floor of dust removal system at terrace of empty bags storage bluiding.
5. I.P.S. flooring at platform at B&MH.
6. Epoxy painting with apcodar 695 , Three coats system on R.C.C. walls, slabs, beams and columns of silo transfer tower, ground floor, first floor, second floor and third floor.
7. Grouting of M.S. Structure for newly provided conveyor gantry.
8. Bitumen base black epoxy paint on side of wall upto 3.5 meter height of silo.

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B & MH PLANT

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ELECTRICAL JOBS

JOB CODE	JOB DESCRIPTION
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04 61 01 ELECTRICAL JOBS :

1. Preventive maintenance carried out on following transofrmers TR-5A,5B
  - a) Inspected primary and secondary cable boxes, end terminations, checked and tightend of connections.
  - b) Tested oil in marshalling boxes on primary and secondary transformers ..
  - c) Replaced silica gel in dehydrating breather of above transformer.
  - d) Checked trip alarm circuit and cleaned all emergency trip boxes.
  - e) Checked of IR value of primary and secondary winidngs of above transformers.
2. Preventive maintenance carried out of TMG/Siemens make ACBs installed at MCC and replaced damaged parts and worn out contacts.
3. Indicating lamps of breaker pannel were replaced.
4. Preventive maintenance carried out on all feeder compartments mounted on the following MCCs :  
MCC4, MCC4A, MCC9.
5. Tested all type of relays installed in the above MCCs.
6. Maintenance job carried out of all lighting distribution boards.
7. Overhauling of following motors were carried out :  
M-2117, M-2121, M-2122 .
8. Inspected and cleaned reclaim control panel.
9. Checked cotnrols of entire conveyor system for proper operation.
10. Repaired of all light fittings installed on all conveyors.

PLANT TURNAROUND - MAY - JUNE 1997

B & MH PLANT

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INSTRUMENT JOBS

JOB CODE	JOB DESCRIPTION
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04 71 01 INSTRUMENTS JOBS :

(01) Provided New 1/2" S.S Air Header (7 Kg/cm2) and Checked leakage.Laid 1/4" S.S. Tube for air purging P/S scale from Air. Header carried out 1/2" S.S. tubing to Solenoid valve. Replaced Datapond of Packer scale No. 2 for checking purpose then provided original Datapond.

Packer scale No - 8 erection job.

Checked Datapond and cleaned its socket of Packer scale

Cleaned all the keyboard and display and checked them

Checked the load cell It was found OK

Calibration of all the packet scale 1,2,3,4,7,8

Checked the RIC card it was ok

All power supply cables for P/S No - 8 were newly laid Tightened all the terminal strip

Checked all the solenoid valve operations

Checked all the lamp indicators and lamps

Checked the relay of packer scale operation wise

Provided new Air regulator and Oil filter on P/S No - 8

Checked load-cell cables and measured the millivolt O/P.

Checked Datapond and cleaned its socket of Packer scale NOS. 1,2,3,4,7,8

Cleaned all the keyboard and display and checked them

Checked the load cell of all the packer scale

Checked all the RIC card of all the datapond

Checked all the solenoid valve operations of all the packer scale Nos.1,2,3,4 & 7.

Checked all the lamp indicators and lamps of all the packer scales.

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- Checked all the relay of all the packer scale operation wise
- Tightened all the terminal strip of packer scale Nos.1,2,3,4 & 7.
- Cleaning and painting of Tolerance reset panel & Loadcell JBS.
- Painting of local junction box of all the packer scale
- Cleaned all the Handswitch and checked it
- Checked all proxy switches
- Calibration of libra weigh scale indicator
- Cleaning of libra weigh scale platform in front of Libra service people & Painting of Libra weigh scale Platform.
- Libra Scale power supply cables protecting tubes of 1/2" were laid.

(02) 40 MT ELECTRONIC WEIGH BRIDGE:

- Removed top plates of platform and aligned 6 nos. Load-cells supports by enlarging holes of top and bottom plates. also cleaned and lubricated the mounting assemblies.
- Welded the broken strips of the platform top plates.
- Cleaned electronic head and calibration was checked.
- The job was done by the Engr/Tech. of M/s Gujarat Scales rep. of M/s Ashbee Scales ,Delhi.

PLANT TURBOPUMPS - MAY - JUNE, 1997

S. & M. PLANT

TECHNICAL DEPARTMENT JOBS

107

JOB CODE      JOB DESCRIPTION

04 81 01      TECHNICAL DEPT. JOBS :

01) Modification of following Belt Conveyors for capacity enhancement from 1200 TPD to 1650 TPD.  
M-1403, M-1419, M-1421, M-2110, M-2112, M-2121 & M-2122.

02) M-2121 Conveyor two way chute with damper provide at discharge end.

03) Product Urea handling / conveying system revamping work is under progress.