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P. S. SECTION  
MTCF DEPTT

REPORT ON

ANNUAL TURNAROUND

DEC 5, 1976 - JAN 24 1977

REPORT (6) (12)  
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Planning & Scheduling,  
Maintenance Department  
IFFCO KALOL

INDIAN FARMERS FERTILISER COOPERATIVE LIMITED

1977

KALOL

P & S SECTION  
MAINT. DEPTT.

ANNUAL TURNAROUND

DECEMBER 5, 1976 TO JANUARY 24, 1977

*Nagendra*

P AMMONIA  
L UREA  
A OFFSITES  
N BSMH  
T

February, '77  
PS/PBK/SS/d

PLANNING & SCHEDULING SECTION

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GENERAL REPORT ON ANNUAL TURNAROUND

December 5, 1976. The turbine of process air compressor of Ammonia Plant ground to a halt, in the early hours of morning. The turbine was opened and extensive damage to turbine rotor, bearings, casing, diaphragms, labyrinths etc. was noticed. After due deliberation it was felt that it would take quite some time to rehabilitate the turbine and accordingly it was decided to undertake all the maintenance jobs including Boiler Inspection by CIB meant for annual turnaround due in March 1977.

Jobs proposed to be handled during the shut down were collected from Production. Preventive Maintenance jobs were added by the respective sections. An assessment of the workload was made. Special tools, tackles and equipment required were examined. Manpower requirement was made. Out-side agencies were contacted for specialist services wherever essential. These are indicated in the following notes. It was found that normal maintenance workload justified shut down upto December 26, 1976 and accordingly Activity Chart with write up was prepared and circulated.

This was however our pious thinking. The task of re-building the turbine was not that simple. The damaged spare parts had to be imported from USA. The turbine specialist from De Laval, USA, after series of contacts could arrive on 23.12.1976 and the critical turbine spares reached at site on 1.1.1977. A separate note on turbine is attached.

After a lapse of 49 days, Ammonia Plant swung back to normalcy on 22.1.77. CO<sub>2</sub> was available on 20.1.77, Ammonia on 22.1.77 and Urea prills streamed down the Tower on 24.1.77.

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TURBINE OF PROCESS AIR COMPRESSOR - AMMONIA PLANT

Model KJDFMV, Equipment No.101-JT

Sr.No.706015

Process Air Compressor turbine stopped at 6.30 AM on 5.12.1976. On inspection, the following damage was noticed.

- a) From inlet side the fourth wheel of the turbine rotor was broken from the hub at several places.
- b) The fourth wheel had cut the casing of the turbine approximately one half inch deep on the two opposite sides.
- c) Labyrinths were damaged completely.
- d) Journal bearing and thrust bearing had been damaged. The thrust bearing got crushed to pieces.
- e) Rubbing marks on the <sup>c</sup>disposition of diaphragms Nos.2, 3, 4 & 5 from inlet were observed. The diaphragms were somewhat bent.
- f) The outboard bearing on which casing is supported with a key way, had cracked and the pieces had come out.

M/s Bharat Heavy Electricals Limited, Hyderabad were contacted and their representative (Mr KV Gopalakrishna) arrived at site. After his on-the spot inspection, we were advised by BHEL that repair of the damaged diaphragms of the high speed turbine was risky. Also they did not have material for manufacture of new diaphragms. They suggested that the vendor, M/s De Laval may be contacted for supply of new diaphragms.

M/s De Laval were contacted for supply of new set of diaphragms, and for deputing an expert to help rebuild the turbine. The expert (Mr Maurice Balan) arrived at site on 23.12.1976.

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The spare parts were air-freighted and reached at site on 1.1.1977.

The following chronology gives the brief description of jobs done on the turbine:

- i) Set of diaphragms, oil guards, 'O' rings, ring back up etc. received at site 1.1.1977
- ii) Grinding, tapping and drilling was done on the broken pieces of pedestal bearing housing 1.1.1977 to 6.1.1977
- iii) Top and bottom diaphragms fitted after thorough checking 3.1.1977
- iv) Labyrinths placed in the top casing and bottom casing 4.1.1977 to 5.1.1977
- v) Spare rotor placed in position - total axial clearance was maintained at 0.172 inch 5.1.1977
- vi) Rotor and diaphragms thrust adjustment checked. Assembled the thrust bearing 6.1.1977 to 7.1.1977
- vii) Turbine casing boxed up 8.1.1977
- viii) Steam and oil piping connections made 9.1.1977
- ix) Alignment with low pressure stage of air compressor 10.1.1977
- x) Turbine run for five (5) hours at 1400 RPM. Speed increased gradually. At 3400 RPM vibration noticed, machine was stopped. 11.1.1977
- xi) Bearing was opened and metal pieces were found in the oil pipe line. Oil was drained from oil console. A magnet was turned around the oil console which attached metallic powder. The entire oil system was thoroughly cleaned. Fresh lub oil was charged in the system. 12.1.1977 to 13.1.1977

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- xii) Trial run. After checking proper clearances and assembling the turbine speed was gradually increased from 500 RPM to 8100 RPM. Overspeed trip mechanism did not work. 14.1.1977
  - xiii) Work on over speed trip mechanism 15.1.1977
  - xiv) Run the turbine to check trip mechanism. Turbine tripped at 7800 RPM while turbine overspeed designed is 7600 RPM considered alright. 16.1.1977
  - xv) Coupling of turbine and Air Compressor LP stage, and LP stage and gear box was done. 16.1.1977
  - xvi) Air taken in the system. Nothing untoward noticed. Turbine - Compressor running normal. 17.1.1977
  - xvii) Ammonia Plant swung back to normalcy
    - CO<sub>2</sub> available - 001.30 hrs 20 20.1.1977
    - NH<sub>3</sub> available - 21.45 hrs 22.1.1977

It will not perhaps be out of place to observe that the damage to the turbine was a singular in itself. On one hand when a damage of this magnitude causing break up of entire rotor wheel has taken place one might conceive damage elsewhere also. But here the damage was essentially of a local nature. Except the fourth wheel of the rotor, all the remaining 8 wheels were not in a bad shape; the turbine casing was practically in-tact except the 4th wheel portion; the air compressor was inspected, it had not received even slightest damage. In fine, it was a touch and go affair.

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I. Manpower Requirement

Total manpower in terms of mandays deployed was under :

a) Permanent

Technicians (Mech)	--	2150 Manday	Manday of 12 hrs.
Technicians (Ele)	--	900 "	"
Technicians (Inst)	--	850 "	"
Welders	--	350 "	"
Riggers	--	150 "	"
Mason	--	50 "	"
Mazdoors	--	550 "	"

b) Hired

Fitters (Mech)	--	35 "
Electricians	--	150 "
Riggers - GSFC, Baroda-	--	90 "
Mason	--	100 "
Carpenter	--	150 "
Mazdoor	--	7000 "

II. Equipment Requirement

a) IFFCO

65 Ton mobile crane	--	1
15 Ton mobile crane	--	1
3 Ton Forklift	--	1
2 Ton Forklift	--	1
Truck	--	2 (1 from Kandla)
Generator welding sets	--	5
Transformer welding set	--	1



Rectifier	-	2
Diesel Generator	-	1
Centrifuge	-	2
Oil filter machine	-	2
Guniting machine	-	1
Vacuum pump	-	1
Dewatering pumps	-	3
Air Compressor	-	1

b) Hired

2 Ton Forklift	-	2
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III. Tools & Tackles

Chain pulley blocks	-	1/2 Ton
Chain pulley blocks	-	1 Ton
Chain pulley blocks	-	2 Ton (2 from Kandla)
Chain pulley blocks	-	3 Ton
Chain pulley blocks	-	5 Ton
Chain pulley blocks	-	10 Ton

Note : Permanent Technicians mandays include  
6 Technicians (Mech) and 2 Technicians  
(Ele) from IFFCO, Kandla.

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Important jobs done by outside parties

Sr.No.	Description	Contractor
1.	<u>ID Fan (101-BJ)</u> Fan foundation was strengthened by increasing the concrete masi. (Period - 15 days)	M/s. Raj Construction Kalol.
2.	<u>Shift Converter (104-D)</u> Changed HTS catalyst - First time.  The catalyst already in the vessel were oxidised and cooled by spray of water. These were removed and new catalyst were charged. It was a 2 day non-stop job and two trucks, one crane (H), three forklifts and a good number hands were pressed into service.  Catalyst Grade : C-21-1 Quantity : 278 barrels.	M/s. Dubey & Company.
3.	<u>Primary Reformer (101-B)</u> Changed reformer tube catalyst - First time.  Removed old catalyst from all the 336 reformer tubes by vaccum, charged fresh catalyst.	M/s. Rajesh Construction.

Sr.No.	Description	Contractor
	Next to air compressor turbine repair, job. This was a critical job. It took 20 days to complete the job, plus the preparatory work of cleaning catalyst placing them in polythelene bags required skilled labour (departmental available) and contract labour was just supplementary. One crane and one forklift were continuously at the job.	
	Catalyst Grade : C-11-9-02 C-11-9-03	
	Quantity : 8400 kg + 7980 <u>16380 kg</u>	
4.	<u>Prill Tower (B-1401)</u>	
	Fibre glass reinforcement lining at the floor was done with Backelite Hylein's Resin HSR-8633. (Period - 15 days)	M/s. Corroseal (I) Ahmedabad.
5.	<u>Prill Tower (B-1401)</u>	
	Civil Work in connection with Stamicarbon modification - RCC slab foundation on the top of prill tower was provided.	M/s. C.C. Mistry.
6.	<u>Prill Tower Machine Room</u>	
	Bitumastic compound lining 15 mm thick on the top of prill tower machine room was applied.	M/s. Schemisight Engineers, Baroda.
7.	<u>Boilers (F-5101 A/B)</u>	
	Refractory work in burner block face with castable refractory, whytheat was done.	As per instructions of A.C.C. Engineer - job was done de- partmentally.

Sr.No.	Description	Contractor
8.	<u>Cooling Tower (H-4401)</u> Some wood work on cooling tower had got damaged. This was repaired.	As per instructions of M/s.Exon Engineers, Bombay - job was done departmentally.
9.	<u>Boiler Chimney</u> Repairs were carried out on the blow down sump between two chimneys.	M/s. C.C. Mistry and Company.
10.	<u>Painting</u> Painting of all the important Primary Reformer, etc. was done.	M/s.S.P.Decorator, Baroda.
11.	<u>Water Treatment</u> Rubber lining of following tanks were changed.  Cation-I Cation-II	M/s.Chemisight Engineers, Baroda.
12.	<u>66 KV Switch Yard</u> Testing of protective relays on CRP	The Ahmedabad Electricity Company
13.	<u>On Load Tap Changer</u> Inspection and maintenance.	Job done departmentally and representative from M/s.CTR, Poona was on site.

EXPERT SERVICES

Expert services were utilised for the following jobs.

Sr No.	Description	Agency
1.	To rebuild the damaged process air compressor turbine of Ammonia Plant	M/s De Laval U.S.A.
2.	To attend to the refractory lining of Reformer in Ammonia Plant	M/s M.H. Detricks Calcutta.
3.	a) To examine the damage to process air compressor turbine in Ammonia Plant  b) To overhaul the following equipments, in Urea Plant i) Nuovo Pignone CO <sub>2</sub> Compressor, ii) Nuovo Pignone Turbine for CO <sub>2</sub> Compressor, iii) Siemens Turbine for PB Compressor	M/s Bharat Heavy Electrical Ltd, Hyderabad
4.	To attend to refractory lining in Offsites Boilers - 2 Nos	M/s Associated Cement Company, Bombay.
5.	Electrical - Relay testing and repairs -oOo-	M/s Ahmedabad Electricity Co., Ahmedabad



Sr.No.

Job Description

2. 105-J  
Refrigerant Compressor
- a) Turbine
- i) Loosened the bolts and lifted the top cover. Found accumulation of scale on 4th impeller, too much.
  - ii) Lifted the rotor - cleaned the blades and all labyrinths.
  - iii) Checked journal and thrust bearing clearances.
  - iv) Boxed up the turbine and checked alignment.
  - v) Overhauled governing system and checked over speed trip.
- b) LP Case
- i) Replaced gear box side mechanical seal.
  - ii) Checked labyrinth clearances. Replaced two number of labyrinth seals.
  - iii) Checked thrust clearance.
  - iv) Replaced journal bearing pads 5 Nos. at turbine side.
- c) HP Case
- i) Found damage on white metal, about 3" came out from the top cover of balance piston. Replaced.
  - ii) Replaced journal bearings at both ends.
  - iii) Checked thrust clearance.
  - iv) Cleaned and checked clearances of labyrinths. Replaced 4 Nos. of labyrinths.
  - v) Replaced 2 Nos. of mechanical seals at both ends.
  - vi) Checked alignment.

Sr.No.

Job Description

d) Gear Box

- i) Checked thrust and journal bearing clearances.
- ii) Checked gear back lash.
- iii) Checked oil guard clearance.
- iv) Checked alignment.

3. 103-J  
Synthesis gas compressor

- a) Opened the top cover and lifted the rotor of main Turbine (103-JBT)
- b) Cleaned and checked the rotor and all the diaphragms.
- c) Checked journal and thrust bearing and labyrinth clearances.
- d) Overhauled the complete governing system.
- e) Checked over speed trip.

BOILER, REFORMER AND CO CONVERSION AREA

1. CIB Inspection (offered on 24th December '76) for the following :

a) 112-C  
Low temperature shift converter Exchanger

Inspected at hydraulic test at 16.5 kg/cm<sup>2</sup> and checked relief valve.

b) 101-F - Boiler Drum (GT 1632)

- i) Inspected the internals, cleaned the inside. Hydraulic test was done at 125 kg/cm<sup>2</sup>.
- ii) Lapped and tested the safety valve and relief valve.



Sr.No.

Job Description

c) 102-B - Auxiliary Boiler

- i) Serviced and cleaned.
- ii) Overhauled 5 Nos. of fan mixed burners.
- iii) Rectified the gland leak of boiler blow down valves.

d) 101-B - Primary Reformer

- i) Removed catalyst from all 336 Nos. of reformer tubes and recharged fresh catalyst.
- ii) Repaired gas distribution plate.
- iii) Repaired refractory in convection zone.
- iv) Inspection of NDT was conducted. Found hair pin crack on top mist weld on 21st catalyst tube in the 6th row.
- v) Attended the defective needle valves of naphtha burner.
- vi) Inspected reformer outlet manifolds, cleaned tube with wire brush.

2. 101-BJ - I.D. Fana) Fan

- i) Replaced out board journal bearing.
- ii) Cleaned and checked inboard bearing.
- iii) Checked bearing cooling arrangements.
- iv) Checked alignment fan and gear box.
- v) Strengthening of foundation by increasing of concrete masi.

b) Gear box

- i) Replaced all journal bearings.
- ii) Checked gear back lash and end float.

Sr.No.	Job Description
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- iii) Checked oil guard clearance.
- iv) Replaced oil cooler cover and cleaned the oil cooler.
- v) Replaced oil DTE Heavy Medium (Turbine-17)
- vi) Checked alignment gear box and turbine.

c) Turbine

- i) Inspected bearings and checked clearances.
- ii) Changed oil of bearings and woodward governor.
- iii) Checked mechanical seal and oil guards.
- iv) Checked governing system.
- v) Checked over speed trip.
- vi) Coupled and regreased all couplings of fan, gearbox and turbine.

3. 104-D Shift Converter

Removed old HTS catalyst and charged fresh catalyst.

4. 103-D - Secondary Reformer

Opened top flange and inspected the air mixture nozzle. Found cracking on it. Replaced the same and boxed the top flange.

5. 107-D Transfer line

Inspected transfer line, riser shroud top. Welded the liner cracks.

6. 101-CA - Primary Waste Heat Exchanger

Tightened the flange joint.

7. 104-J/JA - Feed Water Pumps

a) Pumps

- i) Checked journal bearing clearance.

Sr.No.	Job Description
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- ii) Checked oil seal clearance.
- iii) Replaced lub oil DTE Heavy Medium (Tur-17)
- iv) Tapping to provide addition lub pumps.

b) Turbine

- i) Checked bearing and oil guard clearances.
- ii) Checked governing system.
- iii) Cleaned steam strainer.
- iv) Cleaned oil tank and charged fresh oil - DTE Heavy Medium (Tur-17 )
- v) Replaced oil of woodward governor.
- vi) Checked over speed trip.
- vii) Rectified trip throttle valves.

8. 123-J - Start-up Feed Water Pump

Replaced discharge isolation valve as it was passing.

REFRIGERATION, SYNTHESIS, MEA CIRCULATION AND CO<sub>2</sub> REMOVAL AREA

1. 107-JT - MURRAY TURBINE

- a) Remove the expansion joint and top cover of the turbine.
- b) Inspected the rotor found alright.
- c) Recorded clearances of journal bearing, thrust bearing and labyrinths.
- d) Rectified overspeed tripping mechanism and woodward governor.
- e) Replaced bearing oil and woodward governor oil.

2. Elliot Turbine

Checked journal bearing clearances.

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Sr.No.	Job Description
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### HEAT EXCHANGERS

- 114-C - Mathenator Effluent Feed Water Heater

Attended gas side leak.

- 115-C - Mathenator Effluent Cooler

Tested at  $6 \text{ kg/cm}^2$  pressure. Plugged 3 Nos. of tubes as under mentioned.

Row from top to bottom	Tube from stripper side
4	1
5	2
9	5

- 101-JC - Surface condenser

Plugged 16 Nos. of tubes.

### FACING TOWARDS COOLING TOWER

<u>Left</u>		<u>Right</u>	
Row bottom to top	Tube from Tech bldg.	Row bottom to top	Tube from Tech bldg.
13	12	17	13
11	12	11	8
2	12	12	8
6	1	17	13
2	12	19	13
6	1	26	17
11	12	33	5
13	12	44	12

- 108-C - MEA Solution Centre

Tested at  $8 \text{ kg/cm}^2$ . Found no leak.

- 105-C/1/CB - CO<sub>2</sub> stripper gas exchangers

Tested at  $6 \text{ kg/cm}^2$ . Found 15 Nos. of leaky tubes. Plugged them. No leak in 105-CB.

Sr.No. Job Description

<u>Row</u> <u>from Reformer side</u>	<u>Tube</u> <u>from 103-J side</u>
11	24
12	30
14	28
15	29
38	23
41	29
43	28
6	4
5	5,6
4	3,4,5
5	2,1
	4
	5
	2
	1

6. 110-CA/CB - CO<sub>2</sub> Stripper condenser

Tested at 6 kg/cm<sup>2</sup>. Found 3 Nos. of tubes were leaking in A and 1 in B. In 110-C tubes were plugged and in 110-B tube was expanded.

a) 110-CA

<u>Row</u> <u>from bottom to top</u>	<u>Tube</u> <u>from stripper side</u>
5	2
8	5
9	6

b) 110-CB

<u>Row</u> <u>from bottom to top</u>	<u>Tube</u> <u>from 102-EA/EB side</u>
1	4

7. 116-C - Synthesis gas Compressor - Interstage cooler

Tested at 16 kg/cm<sup>2</sup>. Found 6 Nos. of leaky tubes. Plugged them.

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 Sr.No. Job Description  
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<u>Row No.</u> <u>Top to bottom</u>	<u>Tube No.</u> <u>Left to right</u>
7	5,1
10	1
2	21
4	21, 15
	15

8. 124-C - Synthesid Gas Compressor - After Cooler

Tested 21 kg/cm<sup>2</sup>. Found no leak.

9. 127-CA/CB - Refrigerant Condenser

Tested at 17 kg/cm<sup>2</sup>. Plugged 2 Nos. of tubes.

<u>Row</u> <u>from top to bottom</u>	<u>Tube</u> <u>Towards 101-J side</u>
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17

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10. 113-C - MEA Vaporiser

Opened the cover inspected and cleaned the bundle.

11. 174-C - Lube & Seal Oil cooler

Provided tapping for CW connection for boiler blowdown cooler 174-C and to make connection for BFW from 174-C to 103-D jacket.

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INSTRUMENT JOBS

Ammonia

Sr.No. Job Description

CONTROL ROOM

- The following control room pneumatic controllers were inspected, cleaned, synchronized and put back in position.

FRRCa -1	FICa -13	FRCa -13	PICa -5	PICa -13	TRCa -10
FRCa -2	FICa -15	FRCa -2	PRCa -18	PRCa -25	TRCa -11
FRCa -3	FICa -16	PRCa -4	PRCa -19	PICa -28	TRCa -12
FRCa -5	FICa -17	PRCa -9	PRCa -23	PRCa -12	LRCa -4

- The following control room receivers, recorders (pneumatic) and set point Transmitter and the output gauges were inspected, cleaned, calibrated and put back in service.

FRRCa - 1	FRCa - 18	PRCa - 18	Pdra - 26/34
FRCa - 2	FRa - 35	PRCa - 19	Pdra - 27/35
FRCa - 3	FRa - 33	PRCa - 23	Lra - 1/88
FRCa - 5	FRA - 40	PICa - 13	LRCa - 4
FR - 6	PRCa - 4	PICa - 25	TRCa - 10
FICa - 13	PRCa - 9	PICa - 28	TRCa - 11
FICa - 15	PRCa - 2	PRCa - 12	TRCa - 12
FICa - 16	PICa - 5		

- The following control room receiver gauges were inspected, cleaned, calibrated and put back in service.

POIa - 57	LIa - 82	PIa - 62
LIa - 86	LIa - 80	PIa - 83
LIa - 85	PIa - 80	PIa - 84
LIa - 83	PDia - 51	PIa - 31
LIa - 81	PIa - 150	LIa - 76
PIa - 79	FICa - 19	Fia - 65
LIa - 84	Fia - 63	Fia - 64
PIa - 125	PI - 47	

- The mechanical components of the below mentioned Honey-well Electronic Recorders were cleaned, inspected and refixed. Lubrication was also done.

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 Sr. No. Job Description  
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The calibration of each was checked. The instruments are kept in service.

VR-1	TR-5	TR-13	AR-1
VR-2	TR-6	TR-14	AR-2
VR-3	TR-7	TR-15	ARC-3

- 5. Electro pneumatic convertors for TRCa-10, TRCa-11 and TRCa-12 were calibrated and are kept in service.

FIELD

- 1. All the field Air regulators were opened overhauled and inspected. Replaced the defective components. Also each was set at required pressure.

- 2. Control Valves

Following pneumatic control valve jobs were attended.  
 LC-13 and 14 (106-F and 108-F) level control valves.

The seats and the plug of the valves were inspected. The positioners were cleaned and inspected. Strokes of the valves were checked and adjusted. Actuator was also cleaned. Valves are in service in line.

- 3. LC-15 (107-F level control valves)

The seatrings and plug seats of the valve were badly damaged. New seat rings were fixed and accordingly cuts were taken on plug, matings, lapping was done and seats were matched.

Both the thrust bearing of hand wheel shaft were found in broken condition. They were replaced by SBL bearings.

Valve positioner was cleaned. And actuator was overhauled.

Valve was assembled and stroke was checked and adjusted. Valve is in line and is in service.

- 4. LC-16 (110-F level control valve)

The seat rings and the plug seats of the valve were inspected. As there were scratches, lapping was done and matched the seats.

Hand wheel assembly and actuator were also overhauled.





Sr.No.

Job Description

Valve stroking was checked and adjusted. The valve is in line and is in service.

10. V-102 (Naptha to 101 B)

The seat and plug of the valve were inspected found OK. The plug was loose in actuator stem it was tightened. Replaced the bottom gasket of the body. Cleaned actuator stem.

Valve stroke was checked and found OK. The valve is in service in the line.

11. LC-19 (Cold NH<sub>3</sub> to Storage)

Opened the bonnet portion and checked the valve plug and the seats. As there were scratched, lapping was done, overhauled actuator and valve positioner. After assembling valve stroke was checked and adjusted. The valve is in line and is in service.

12. The following field Transmitters were calibrated after cleaning F/N, Relay etc. and inspecting the parts. The instruments are back in line and are in service.

PRCa - 2	PICa - 28	FICa - 13
PRCa - 4	PIa - 81	FIA - 49
PICa - 5	PIa - 82	FRCa - 1
PICa - 13	FIC - 9	FRCa - 2
PRCa - 12	FIC - 10	FRCa - 5
PRCa - 18	FIC - 11	PIA - 84
PRCa - 23	FICa - 15	
PRCa - 25	FRCa - 18	

13. All the control valve stems were cleaned and greasing was done. Each valve was stroke and adjusted. Cleaned the connected VIP's also. The instruments are back in line and are in service.

14. AIR DRIER

The silica gel were screened and made up the quantity. Also Thermostate micro switches were cleaned and heater insulation was checked. Also greased the 4 ways valve. The equipments in service.





Sr.No.

Job Description

High Stages

- LA-131 HP Case LO Seal oil Tank level alarm.
- LS-132 HP Case LO Seal Oil Tank Level AOP start.
- LS-133 HP Case LO Seal Oil Tank Level Compressor Trip.
- LA-134 HP Case HI Seal Oil Tank Level Alarm

Low Stages

- LA-133 - LP Case LO Seal Oil tank level alarm.
- LS-136 - LP case LO seal oil Tank level AOP start.
- LS-137 - LP Case LO seal oil Tank level Compressor trip.
- LA-138 - LP Case HI Seal oil tank level Alarm.

8. 103-J Lube oil switch

- PA-82-103 J LO lube oil Pr. Alarm 0.84 kg/cm<sup>2</sup>
- PS-83-103-J LO Lube oil Pr. AOP start 0.84 kg/cm<sup>2</sup>
- PS-84-103-J LO Lube oil Pr. Compressor Trip 0.65 kg/cm<sup>2</sup>
- 103 Balance piston.

9. PA-93 HP Case balance piston high pressure alarm. Setting checked and found OK.

10. The solenoid operation of 105-J trip system was suspected, it was opened, overhauled and performance was checked, it was found perfectly OK.

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INSPECTION REPORT

Ammonia

Primary Reformer (101-B)

1. Radiography

Radiographic test was done on the following :-

- a) 50% of the field welds of the riser tubes. It covers those welds which were not radiographed last year.
- b) 25% portion of field welds of the bottom headers. It also covers the portion of welds not radiographed during last turn-around.

Results: All radiographs show defect free welds.

Equipments used: Camera IRC-4 Source IR 192 Film Afga D-7.

2. Dye Penetrant Test

Dye penetrant test was carried on the following :

- a) 50% of the field welds of riser tubes (which were not radiographed).
- b) 75% portion field welds of header which were not radiographed
- c) Shop welds numbering about 588 were inspected. On two welds cracks were revealed by Dyecheck. The length of these cracks varied between 3 to 7.00 mm.

Results: All welds except two shops welds of catalyst tube revealed no defects.

The welds on which cracks were found are :-

- i) Top most weld on the 21st catalyst tube in the sixth row.
- ii) Top most weld on the 5th catalyst tube in the eighth row.

Equipment used: Dye penetrant kit of PMC make.

### 3. Magnetism Test

All catalyst and riser tubes were tested for presence of magnetism.

Results: No trace of magnetism was found on any tube.

Visual inspection of the bottom header was carried out. It was found in apparently good condition.

Visual inspection was carried out of the following :

- a) Convection zone of primary reformer 101-B.
- b) Transfer line 107D.
- c) Secondary reformer 103-D.
- d) CO<sub>2</sub> stripper - 102-E A&B.
- e) Converter - 104-D (HIS)
- f) Heat Exchangers.

#### Convection zone of 101-B

Refractory had fallen at number of places. The repair was carried out with help of M/s. Detrick India.

H.T. Section : OK

#### L.T. Section

Many distributor plates had got bent and fallen off from their supports. Some of the supports for the finned tubes have burned off partly. These supports are close to distributor plates. This we feel is because of excessive local temperature in L.T. zone. The distributor plates were brought in proper shape.

#### Secondary Reformer 103-D

The secondary reformer air mixer was found in damaged condition. The perforated incoloy plate had buckled and had cracked at number of places. A new mixer was welded to the air inlet pipe. The butt weld revealed no defects. It is suggested that old mixer should be repaired by weld a new perforated plate to it. The S.S. liner had cracked at number of places. These were repaired satisfactorily.

CO<sub>2</sub> Strippers - 102-EA (East)

All internals were found in perfect condition.

CO<sub>2</sub> Strippers - 102-EB (West)

Demister pad was found slightly damaged at one or two places. A local repair was suggested otherwise internals were found in perfect condition.

Transfer line - 107-D

Entire transfer line was inspected. The S.S. linear has buckled at number of places. The buckled are covers almost half the length of the transfer line. (From 5th riser to 8th riser) Two number of circumferential cracks were observed between thermo-couple joint and the gas inlet nozzle to secondary reformer. These cracks were repaired satisfactorily.

Shift Converter - 104-D (HTS)

The longitudinal and circumferential welding seams of the vessel were visually examined. Welds appeared to be in good condition. Both floating screens were found in perfect condition. The other internals and nozzels were also in good condition.

Heat Exchangers

- 110-CA            It was tested at 6.5 kg/cm<sup>2</sup> pressure. 3 tubes were leaky. They were plugged.
- 110-CB            It was also tested at 6.5 kg/cm<sup>2</sup> pressure. Sweating was detected at one tube. It was expanded to remove sweating.
- 105-C A&B        Both exchangers were tested at 7 kg/cm<sup>2</sup> pressure. Five tubes were plugged in each of them.
- 116-C            It was tested at 16 kg/cm<sup>2</sup> pressure. Sixty leaky tubes were plugged.
- 122-CA            It was tested and one leaky tube was plugged.
- 101-JC            It was tested at atmospheric pressure and eleven leaky tubes were plugged.
- 115-C            It was tested at 5 kg/cm<sup>2</sup> and three leaky tubes were plugged.



108-C It was tested at 8 kg/cm<sup>2</sup> pressure. No leak was found.

113-C It was tested at 8 kg/cm<sup>2</sup> pressure. No leak was found.

4. Thickness Survey

Thickness measurements were carried out on the following pipe lines and vessels.

MEA-1	-	300	MEA-26AB	-	62.5/37
MEA-2	-	100	MEA-27AB	-	450
MEA-3	-	100	MEA-29AB	-	300
MEA-7	-	300	MEA-12AB	-	300
MEA-10AB	-	300	MEA-15AB	-	300
MEA-11	-	350	MEA-20	-	300
MEA-25	-	8			
CO-1AB	-	450	CO-7	-	600
CO-6AB	-	450	CO-15	-	750
PW-1	-	150	PW-20AB	-	150
PW-4	-	62.5	PW-29AB	-	250
PW-5	-	50	PW-31	-	300
PW-8	-	37.5	PW-17	-	100
PW-19	-	150/100			
PG-3	-	450	PG-15	-	350
PG-6	-	450	PG-14	-	400
PG-10	-	450	PG-18	-	300
PG-13	-	400	PG-21	-	500
SG-42	-	100	SG-35	-	300
SG-43	-	350	SG-30	-	350
SG-23	-	300	SG-13	-	300
SG-12	-	350	SG-6	-	300
SG-11	-	250	SG-18	-	450
SG-62 AB	-	100	SG-22	-	300
SG-44	-	100			

Auxiliary Boiler blow down lines :

Vessels

Raw gas seperator - 102-F

CO<sub>2</sub> Absorber - 101-E

CO<sub>2</sub> Stripper reflux drum - 103-F

Results

Recorded.

Equipments used :

Krantkraemer USK 5 & thickness metre UTG 101.

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SHUTDOWN JOBSCivilAMMONIA

Sr.No.	Job Description	
1.	<u>Primary Reformer (101-B)</u>	
	a) Refractory work in primary reformer and in auxiliary boiler.	Departmental Work.
2.	<u>I.D. Fan (101-BJ)</u>	
	Strengthening of fan foundation - increased the concrete masi.	Done by M/s.Raj Construction (Time - 15 days)
3.	Construction of drain between primary reformer and secondary reformer.	Work done by C.C. Mistry.
4.	<u>Painting</u>	
	a) Repairs to cast iron drain line near reformer.	Departmental work
	b) Painting work of primary reformer and auxiliary boiler heat resisting light gray paint applied.	Work done by M/s. S.P. Decorator, Baroda (Time - 20 days)

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U R E A P L A N T

Mechanical

Sr.No.	Equipment & Code No.	Job Description
1.	<u>K-1101/1</u> <u>CO<sub>2</sub> Centrifugal</u> <u>Compressor</u>	<ul style="list-style-type: none"> <li>a) Compressor was completely stripped for overhauling.</li> <li>b) Rotor and all internals viz diaphragms, labyrinths, bearings are in good shape. All clearances recorded. Thrust bearing clearance was reduced to 0.012" from 0.015".</li> <li>c) Old thrust pads used. All other clearances were found within limits.</li> <li>d) Axial probe was adjusted to match actual movement of rotor.</li> <li>e) All relief valves tested.</li> </ul>
2.	<u>Q-1101-1 NUOVO</u> <u>Pignone Turbine</u>	<ul style="list-style-type: none"> <li>a) Turbine was completely stripped for overhauling.</li> <li>b) Very light silica deposit was found on last 3 - 4 wheels which was removed by mechanical cleaning methods.</li> <li>c) All other internals viz diaphragms, labyrinth found OK. Clearances were recorded. Rear journal bearing had slight scoring marks, bearing was changed. Thrust pads were in good shape.</li> <li>d) Total axial movement = 0.24 mm (9.6 thou) matched with axial probe.</li> <li>e) Over speed checked. Turbine trips at 7000 rpm. Design trip speed = 7277 rpm.</li> </ul>
3.	<u>K-1101/2</u> <u>PB Compressor</u>	<ul style="list-style-type: none"> <li>a) First and second stages were completely overhauled.</li> <li>b) Pistons were pulled out and liners inspected. No appreciable wearing of liners were noticed.</li> </ul>

Sr.No. Equipment & Code No.

Job Description

- c) Piston ring clearances were found excessive, new rings were installed in both stages.
- d) 1st stage piston wear pads were found completely worn out. New pads were provided.
- e) All clearance viz piston to liner, piston ring, cylinder bore, cross head to cross head guide, piston to top and bottom dead centres recorded and were within limits.
- f) Third stage liner also was inspected and found OK. All suction and discharge valves on 1st, 2nd and 3rd stage were changed with preassembled/ tested valves.
- g) 1st, 2nd & 3rd discharge relief valves were checked for the prescribed set pressures.
- h) Crank case was cleaned and fresh oil charged.
- i) Barring gear box was installed. It was now a modified splined shaft.
- j) David Brown Gear box opened for inspection. All gears in good shape.
- k) High speed shaft bearing clearances were recorded and they were normal.
- l) 3 Nos. worn out thrust pads were changed on this shaft to bring the axial play to 0.35 mm from 0.45 mm.
4. Q-1101/2  
Siemens Turbine
- a) Both front and rear journal bearings were opened for inspection - found excessive damage. New bearings installed.

Sr.No.	Equipment & Code No.	Job Description
		<ul style="list-style-type: none"> <li>b) Thrust pads also were found worn out. New pads installed to bring the axial float to 0.007" from 0.020".</li> <li>c) Over speed trip mechanism was found stuck-up - cleaned the same. Turbine was tested for overspeed trip. Trips = 10700 (Normal tripping = 11000)</li> </ul>
5.	Q-1113 CO <sub>2</sub> oil console lube oil Turbine	<ul style="list-style-type: none"> <li>a) Turbine was completely stripped for overhauling.</li> <li>b) No corrosion/erosion of parts was noticed. Neither were any deposits.</li> <li>c) New bearings, carbon rings, oil seal rings were installed.</li> <li>d) Turbine was tested for o/s trip. Trips at * 1850 rpm. Design trip speed is 1900 rpm.</li> </ul>
6.	P-1201/B & Q-1201/B Carbamate Pump B and Turbine.	<ul style="list-style-type: none"> <li>a) Pump was completely stripped for overhauling. A cavity/crack about 3" long was noticed in the main block where the 3rd plunger runs. Block was changed with a spare one.</li> <li>b) HP plunger packings/carbon rings were found broken/worn out. New HP &amp; LP pkg. was installed.</li> <li>c) Plunger condition was good. They were realigned.</li> <li>d) Crankcase cleaned and new oil was put in. Couplings opened and changed with new grease.</li> <li>e) Gear box was opened. All gears were in good shape. High speed pinion journal bearing clearances were recorded and they were normal.</li> </ul>

Sr.No.	Equipment & Code No.	Job Description
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|----|---|---|
|    |   | <ul style="list-style-type: none"> <li>f) Gear box oil was changed.</li> <li>g) Pump suction and discharge RV's were checked for set pressures.</li> <li>h) Turbine journal bearing was inspected and clearances taken. They were within limits.</li> <li>j) Oil charges renewed. Governor oil also changed.</li> <li>k) Oil coolers/filters cleaned</li> </ul>   |
| 7. | <u>P-1201/A &amp; Q-1201/A</u><br>Carbamate pump A and<br>Turbine. <span style="margin-left: 2em;">/were</span> | <u>Pump</u> <ul style="list-style-type: none"> <li>a) Pump not checked as it was overhauled only in Nov '76 when all packing/changed, plungers and valves etc. were checked.</li> </ul> <u>Turbine</u> <ul style="list-style-type: none"> <li>a) Both the couplings were greased.</li> <li>b) Gear box was opened for inspection. Internals found in good condition. High speed pinion journal bearings clearances were recorded - normal. Turbine main journal bearings was opened - good condition clearances OK.</li> <li>c) All bearing oils, gear box oil and governor oil were changed.</li> <li>d) Emergency trip system was made operable. Pump suction and discharge RV's were checked for set pressures. Oil coolers/filters were cleaned.</li> </ul> |
| 8. | <u>P-1102 &amp; Q-1102</u><br>Ammonia Pump and<br>Turbine.  | <u>Pump</u> <ul style="list-style-type: none"> <li>a) Pump crank case internals were thoroughly inspected. Main bearing, big end bearings, gudgeon pin and bush, cross head shoes, shoe guides were found in excellent condition.</li> </ul>  |

Sr.No.Equipment & Code No.	Job Description
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- b) Clearances on all bearings were measured and found within limits except Gudegon bush No.3 (counting turbine end) which had excessive clearance. New bush installed.
- c) All bolts/nuts checked for tightness. Crank case cleaned and charged with new oil.
- d) Gear box was opened. High speed pinion inboard bearing was found damaged. New bearing (white metal lined) made indigenously by a local party was installed.
- e) Slight pitting marks noticed on the gears. Gear box thoroughly cleaned and new oil charged.
- f) Both couplings G.B. to pump and G.B. to turbine were filled with grease.

Turbine

- a) Turbine was stripped completely for check up/overhaul.
- b) Turbine wheels were in excellent condition. No pitting or deposits were noticed.
- c) Journal bearing clearances were normal. Bearing oil and governoil oil was renewed. Trip valve made operable by increasing the sliding clearance between valve and guide.
- d) Oil coolers filters cleaned.
- e) Turbine overspeed system was checked. Turbine trips at - 4600 rpm  
Design trip speed- 4600 rpm



Sr.No.	Equipment & Code No.	Job Description
9.	P-1114 A Condensate extra- ction Pump.	a) Pump was pulled out for overhauling. b) 1 No. diffuser found slightly cracked. Replaced with a new diffuser. c) New radial/Thrust ball bearings were installed. d) Mechanical Seal was lapped and put back.
10.	P-1408 Melt Pump	a) Pump suction cover was opened for check-up. b) Impeller and other internals were found OK. c) Bearings were changed with fresh grease.
11.	M-1401 Prilling equipment	a) Both sets of prilling equipments were thoroughly overhauled. b) Variator, drive shaft belts etc. were checked. c) Oils were removed and fresh grease charged in housing. d) New V-belts provided.
12.	K-1401/1 to 4 ID Fan	a) New Aluminium hub cover was provided for Fan No.2. b) Damaged belts were changed. c) Bearings were inspected and found OK. d) Fresh greased charged.
13.	M-1403 Prill scraper	a) Scraper blades height was adjusted so as to clear off the new FRP lining at Prill Tower bottom V-belts, hydraulic coupling oil, gear box oil were checked/damaged.

Sr.No.	Equipment & Code No.	Job Description
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PRESSURE VESSELS INSPECTION/TESTING

- |    |                                    |   |
|----|------------------------------------|---|
| 1. | <u>V-1202</u><br>Rectifying column | a) Top cover was opened. All internals viz Rashi-g rings, grid etc. were in good condition. Boxed up.   |
| 2. | <u>H-1202</u><br>HP Condenser      | a) Condenser top cover was opened with bolt tensioning rig.<br><br>b) Rashi-g rings were removed. Distributor plate was removed to see the tube condition. Tube condition/welding to tube sheet were found in good condition.<br><br>c) Anti splash ring which was found detached - rewelded with low ferrite electrode.  |
| 3. | <u>V-1301</u><br>Desorber          | a) Desorber manhole cover was opened for inspection.<br><br>b) Trays were found in position. No damage was noted. Boxed-up.   |
| 4. | <u>V-1201</u><br>Autoclave         | a) Autoclave top manhole was opened.<br><br>b) All the 10 distributor trays were dismantled so as to inspect the complete length of Autoclave.<br><br>c) 100% dye check done on weld joints. Between (1 & 2), (2nd & rd) and (3rd & 4th) trays, minor welding defects were noticed.<br><br>d) These were ground and welded with low ferrite 316L electrodes and dye checked again. Ferrite content checked with ferrite meter and found less than 0.032% (permissible 2% max) |

Sr.No.	Equipment & Code No.	Job Description
5.	<u>V-1501</u> 4 ATA Boiler drum	a) RV's removed and tested in shop for popping pressure.  b) Boiler was afford for test to the Chief Inspector of Boiler, Gujarat State. Approved. Test pressure : 10 kg/cm <sup>2</sup> .
6.	1st & 2nd Eva- porators <u>H-1422 &amp; H-1424</u>	a) Manhole covers were opened. All internals were OK.
7.	<u>H-1104</u> CO <sub>2</sub> Spray Cooler	a) Manhole was opened.  b) Internals were in good shape. No corrosion was observed. Painted with Epoxy from inside.

C O O L E R S

Following coolers have been cleaned :

1.	H-1111	K-1101/1 Inter coolers.
2.	H-1112	K-1101/1 After coolers.
3.	H-1113 A/B	K-1101/1 Main lub oil cooler.
4.	H-1114	Steam condenser.
5.	H-1121	K-1101/2 1st stage inter cooler
6.	H-1122	K-1101/2 2nd stage inter cooler
7.	H-1123	K-1101/2 Lub oil cooler.
8.	H-1204	Recirculation heater.
9.	H-1206	Circulation system I water coolers.
10.	H-1207	Circulation system II water coolers.

Sr.No.	Equipment & Code No.	Job Description
11.	H-1502	Vent condenser.
12.	H-1421	Flash tank condenser
13.	H-1425	2nd stage evaporator - 1st condenser
14.	H-1426	2nd stage evaporator - 2nd condenser
15.	H-1423	1st stage evaporator condenser could not be pulled out - Crane limitation.

X Both shell and  
 X tube side cleaned.  
 X Tube side cleaned  
 X with cutter plus  
 X caustic circula-  
 X tion.

GENERAL

1. Steam leak jobs attended.
2. Ammonia system RV's reclassified.
3. I.O. console oil centrifuged and filters changed.
4. Ammonia filter cleaned.
5. 1st and 2nd isolation valves of IRC1201 overhauled.
6. New flush water connection to sample point at stripper outlet.
7. Flush water valves to various lines attended.
8. Steam isolation valves for P-1102, P-1201 A/B plug and seat lapped.
9. Isolation and recirculation valves for carbamate pumps serviced.
10. Tail pipes of RV's on compressors modified.
11. Stamicarbon modification - Jobs like C.W. steam tappings etc. taken.

INSTRUMENT JOBS

Urea

Sr.No.	Job Description
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1. TI-1/TI-2  
Overhauled and calibrated both the multi point temperature indicators.
2. PR-1121  
Overhauled and calibrated the pressure transmitter.
3. Pressure transmitters  
Flushed out the impulse lines and calibrated the following pressure transmitters :  
  
PRC-1501; PIC-1502; PRC-1504; PRC-1202; PR-1145; PIC-1128/1129; PR-1123; PI-1145; PI-1122; PI-1124; PI-1125; PI-1126; PI-1163.
4. P-1201 A/B (Carbamate Pumps)
  - a) Replaced both the defective tachometers by new tachometers.
  - b) The manual loaders for pump speed regulation were also defective. Replaced them by Taylor manual loaders and changed the old tubes of local panel - HIC-1203.
  - c) Calibrated the pressure switches and pressure gauges of gear box and crank case lube oil system.
5. P-1102 (NH<sub>3</sub> Pump)  
Calibrated the pressure switches and pressure gauges of lube oil system.
6. HICV-1421  
Overhauled the pneumatic pilot valve and solenoid valve and valve actuator. Changed pneumatic tubes and checked valve performance for prill and divert.

Sr.No.	Job Description
7.	<p data-bbox="327 380 662 414"><u>23 ata steam drum</u></p> <p data-bbox="327 448 1468 515">a) Changed the metallic gasket of top and bottom flanges of level trol.</p> <p data-bbox="327 548 1332 582">b) Changed air regulator bowl of LC-1501 level trol.</p> <p data-bbox="327 616 1404 649">c) The top isolation valve bonnet is changed by new one.</p> <p data-bbox="327 683 1364 716">d) Cleaned and inspected level transmitter/controller.</p> <p data-bbox="327 750 1212 784">e) Changed gasket of p/g point on top of drum.</p>
8.	<p data-bbox="327 806 598 840"><u>Gland Packings</u></p> <p data-bbox="327 873 1149 907">Renewed gland packing in following valves :</p> <p data-bbox="327 940 1021 974">FR-1502-TX-HP isolation valve gland.</p> <p data-bbox="327 974 750 1008">PRCV-1504 valve gland.</p> <p data-bbox="327 1008 941 1041">LCV-1501 (23 ata) - valve gland.</p> <p data-bbox="327 1041 1077 1075">40 ata steam p/g isolation valve gland.</p> <p data-bbox="327 1075 726 1108">LCV-1504 valve gland.</p> <p data-bbox="327 1108 861 1142">PCV-1502 (condensate) gland.</p> <p data-bbox="327 1142 774 1176">PICV-1128 - valve gland</p> <p data-bbox="327 1176 766 1209">PCV-1221 - valve gland.</p>
9.	<p data-bbox="327 1220 957 1254"><u>LC-1502 (9 ata level transmitter)</u></p> <p data-bbox="327 1288 1093 1321">a) Changed gasket of chamber top flange.</p> <p data-bbox="327 1355 1149 1388">b) Cleaned and inspected level transmitter.</p> <p data-bbox="327 1422 1516 1512">c) Changed the gasket of PIC-1502 impulse line tapping flange. Flushed out the impulse line of PIC-1502 and chamber of level trol.</p>
10.	<p data-bbox="327 1545 574 1579"><u>Control valves</u></p> <p data-bbox="327 1612 1516 1668">a) Cleaned valve stems, greased them and checked valve strokes of all the control valves.</p> <p data-bbox="327 1702 1500 1731">b) Made free the Autman change over switches of serok valves.</p>

Sr.No.	Job Description
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- |     |  |
|-----|--|
| 11. | <u>Kota Temperature recorders</u><br>Overhauled, lubricated and calibrated the following temperature recorders.<br><br>TR-1, 2, 3, 4 & 5.  |
| 12. | <u>Temperature indicators (servotran)</u><br>Overhauled and calibrated the following temperature indicators Comp. panel.<br><br>TIH-1153, 1125, 1133, 1124, 1130, 1128<br>THCO-1124<br>TIL-1131 and 1129<br>Main panel<br>TIH-1101, 1201, 1202<br>TIL-1101 for urea melt low temperature.<br>TI-1101 |
| 13. | <u>E/p convertors</u><br>Overhauled and calibrated all the E/p convertors.   |
| 14. | <u>TR-1206 (T/C)</u><br>Removed thermocouple for inspection and found it ok.   |
| 15. | <u>LCV-1101</u><br>Provided new coupling block for connecting actuator shaft and butterfly shaft.  |
| 16. | <u>Air lines and Air regulators</u><br>Flushed out all the lines and header of Instrument Air and overhauled all the field air regulators and control room air header regulators. Changed defective parts of regulators wherever needed.   |
| 17. | <u>Field pressure switches</u><br>All the pressure switches are calibrated and checked alarms by operating them from field.  |

Sr.No.	Job Description
18.	<u>FIC-1204 (Rotameter)</u> Opened it for inspection and found it alright in all respects.
19.	<u>DPI-1203-IX</u> Cleaned the impulse lines and checked IX. Found the capsule damaged. So calibrated new d/p cell and fixed it and filled up LP side with oxygenox grease.
20.	<u>LRCV-1201</u> Removed valve from line for inspection. Seat and plug both were found defective due to erosion. Replaced them by new seat and plug overhauled v/p and v/p TX.
21.	<u>PRCV-1201</u> Removed for inspection. Seats plug both are found defective due to erosion. Replaced both of them. Overhauled v/p.
22.	<u>Panel receivers</u> a) Calibrated all the receivers including set point transmitters in compressor and main panels. b) Checked seal leak of all controllers and rectified the leak wherever found. c) Calibrated all the panel receiver gauges.
23.	<u>LIC-1202/PRC-1202</u> Removed condensate purge rotameter. Cleaned it.
24.	<u>FR-1101 TX</u> Provided 1/2" dia tube with two valves for draining accumulated water. Tapping is taken from HP side of d/dall tube. Calibrated the d/p transmitter.
25.	<u>FE-1123</u> Removed defective main isolation valve of HP side and welded new one.



Sr.No.	Job Description
26.	<u>P-1201 A/B (discharge pressure gauges)</u> Removed pressure gauges. Cleaned the tappings. Provided new diaphragm to B-Pump discharge p/g. Calibrated both the pressure gauges.
27.	<u>HICV-1201</u> Overhauled v/p and v/p-TX. Reconnected feed back livers and adjusted the stroke.
28.	<u>PCV-1501 (HP Condensate Flush system-1)</u> a) Removed valve for inspection. Seat and plugs are found slightly damaged. Made new seat and plug of lowerer and fixed them. b) PC-1501 calibrated the controller.
29.	<u>HICV-1422</u> Removed valve from line and found its body fully chocked up with Urea cleaned the body. Opened split body changed gasket and assembled it. Found it all OK.
30.	<u>FI-1202 (Integral Orifice)</u> Removed, cleaned, calibrated and fixed back.
31.	<u>Insulation</u> Provided insulation to the following instruments : PRCV-1201; FIC-1204 (rotameter); PRCV-1504, LICV-1201; LRCV-1201; HICV-1421.
32.	<u>General cleaning</u> Made the general cleaning of panel instrument and field instruments.
33.	<u>LC-1123 (Leveltrol)</u> Checked the calibration of transmitter and controller of level trol and checked its performance.

Sr.No.	Job Description
34.	<u>TR-1210 (T/C)</u> Leakage was found through thermowell flange; opened, cleaned the ring and fixed back.
35.	Checking alarms of all AUs and provided the new bulbs wherever found fused.
36.	<u>PRCV-1504</u> a) Adjusted valve stem down by one thread for tight shutoff. b) Removed solenoid valve as trip is by passed.
37.	<u>Trip circuit checking</u> The complete trip system is checked for the following machines. a) Centrifugal compressor (K-1101-1) b) Reciprocating compressor (K-1101-1) c) Carbamate pumps (P-1201 A/B) d) Ammonia Pump (P-1102)
38.	<u>Field press gauges</u> Calibrated all the field pressure gauges.
39.	<u>PICV-1301</u> Tightened steam tracing line fittings for stopping leak.
40.	<u>K-1101 1/2 &amp; P-1101 1/2</u> Fixed back the pressure gauges, temperature gauges, thermocouples and probes for vibration monitor.
41.	<u>AnR-1121 (CO<sub>2</sub> Analyser)</u> Calibrated analyser and recorder.
42.	<u>Dynacraft machine (Urea belt scale)</u> Cleaned RVDT, LVDT, knife edges and calibration chain.

Sr.No.	Job Description
43.	<p><u>Q-1101-2 (T/E)</u></p> <p>a) Provided new extension wires for bearing thermo-couples.</p> <p>b) Changed dial thermometers for 60 ata steam temperature for both the turbines.</p>
44.	<p><u>Vibration monitors</u></p> <p>a) Q-1101-1 (Front) - Radial vibration probe and proximeter were replaced by indigenous probe and proximeter calibrated and put in line. The capacitor of 10MF of monitor is replaced.</p> <p>b) Q-1101-1 (Rear) - Radial vibration probe and proximeter were replaced by indigenous probe and proximeter. Calibrated and put in line. The capacitor of 10MF of monitor is replaced.</p>
	<p><u>Reciprocating Compressor</u></p>
	<p>c) VM-1157 (gear box) the proximeter Sr. No.32834 model No. 3109 calibrator 300 is replaced by other proximeter (Beltly Nevada) bearing No.39014 model No.3115 calibration 300.</p> <p>d) All okay lamps were replaced by LEDs (Red colour).</p> <p>e) All the vibration monitors are calibrated and put in line except K-1101-1 rear.</p>

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INSPECTION REPORTUrea1. Autoclave (V-1201)

Dye penetrant test was performed on the all welding seams of the S.S. Liner of the autoclave.

The following minor defects were found.

- a) One fine transverse surface crack was found on the vertical welding seam (Prill tower side) in the compartment No.2. The length of the crack will be about 2 mm long.
- b) One hole ( $\frac{1}{2}$  mm dia. X 1 mm deep) was found in between welding seam and parent metal. This hole is since fabricated. This hole is in the compartment No.3 and on the vertical seam of control room side.
- c) One fine transverse crack was found on the control room side vertical seam in the compartment No.4. The length of the crack will be about 3 mm long.

These defects were repaired, checked again and found OK. The ferrite content was measured and found .03% average.

Equipment used

- a) Dye penetrant kit.
- b) Ferritescope EN 8Fe

2. H.P. Condenser (H-1202)

This vessel was inspected and crack was found on the circumferential welding of antispashing. The crack extends to almost  $\frac{3}{4}$  of the circumferential weld. The cladding and liner is in good condition. No erosion or corrosion appears to have taken place. This was repaired rechecked and found OK. The ferrite content was measured and was found .025% (average).

Instrument used

- a) Dye penetrant kit.
- b) Ferrite Scope EN 8Fe.

3. CO<sub>2</sub> Spray Cooler (H-1104)

The top portion of the vessel was inspected visually. The internal fittings were found OK. Some rust deposit was found by the side of circumferential welding zone. These rusting was cleaned and painted with epoxy green.

4. Turbine rotor of Ammonia Pump

This rotor was checked. No defect was found.

## 5. Thick survey was carried out for the pipe lines, tanks and vessels as follows :

a) Vessels

- i) Stripper - H-1201.
- ii) HP Condenser - H-1202
- iii) HP Scrubber - 1203
- iv) LP Carbamate Condenser - H-1205
- v) LP Carbamate Separator - V-1205
- vi) Desorber Heat Exchanger - H-1301
- vii) Desorber - V-1301
- viii) Coolers of Centrifugal Compressor - H-1111 & H-1112
- ix) Coolers of reciprocating compressor - H-1121 & H-1122
- x) Separators for centrifugal compressor - V-1111 & V-1112
- xi) Separators for reciprocating compressor V-1121 & V-1122.

b) Tanks

- i) Ammonia water tank - T-1301
- ii) Urea storage tank - T-1401
- iii) Condensate Tank - T-1501

c) Pipe Lines

- |                        |                          |
|------------------------|--------------------------|
| i) PR 1204 - 8" X 1    | xiv) PR 1207 - 14" X 4   |
| ii) PR 1203 - 8" X 1   | xv) GA 1112 - 6" X F2    |
| iii) PR 1201 - 8" X 1  | xvi) GA 1201 - 6" X 4    |
| iv) PR 1224 - 3" X 4   | xvii) GA 1203 - 1" X 1   |
| v) PR 1212 - 4" X 1    | xviii) MA 1106 - 4" X E2 |
| vi) PR 1202 - 10" X 1  | xix) MA 1203 - 4" X 4    |
| vii) PR 1208 - 4" X 1  | xx) GA 1202 - 1" X F2    |
| viii) PR 1205 - 8" X 1 | xxi) PR 1230 - 6" X 1    |
| ix) PR 1205 - 6" X 1   | xxii) PR 1226 - 2" X 4   |
| x) PR 1219 - 8" X 3    | xxiii) MA 1201 - 3" X E2 |
| xi) PR 1215 - 16" X 6  | xxiv) PR 1223 - 4" X 3   |
| xii) PR 1214 - 12" X 6 |                          |
| xiii) PR 1206 - 6" X 6 |                          |

Results

Recorded.

Equipment used

IMECO Ultrasonic Thickness Gauge UTG 101 Accuracy  $\pm$  5% & Krautkrafer USK-5 German make.

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SHUTDOWN JOBS

Civil

U R E A

Sr.No.	Job Description	
1.	<u>Prill Tower Scrapper (M-1402)</u>	
	a) Prill Tower scrapper floor 106 m level	
	i) Patch repairing work done with Epoxy mortar.	Departmental
	ii) Fiber glass reinforcement lining at the floor done with Bakelite Hylem's Resin HSR 8633.	Work done by Corroseal (India) Ahmedabad (Time - 15 days)
2.	Stack modifications Civil Work (Founda- tion) on top of P.T. RCC Slab founda- tion corrected.	Work done by CC Mistry.
3.	Bitumastic compound lining 15 mm thick on top of prill tower machine room.	Work completed by M/s.Chemisight Engrs. Baroda. (Time - 5 days)
4.	<u>Painting work</u>	
	a) Painting work on machines etc. at various levels. Epoxy gray paint applied.	Departmental work.
	b) Painting work on Bucket elevator structure Epoxy green paint applied.	M/s.Paint Decore Ahmedabad (Time 10 days)
	c) Painting work for the supports and structure at Horizontal belt under- neath scrapper floor. Epoxy green paint applied.	Department

O F F S I T E S

Mechanical

Sr.No.	Job Description
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COOLING TOWER AREA

1. Cooling Towers (H-4401 & H-4402)  
 Both cooling tower basin sumps were drained of water. They were thoroughly cleaned and civil jobs were attended. The damage to cooling tower wood work was attended departmentally under the supervision of an Engineer from M/s.Exon Engineers, Bombay.
  
2. C.T. Fans
  - a) C.T. Fan No.K-4401 (Ammonia)  
 Checked and found OK; charged new oil - Servo System 526  
 Qty. : 50 ltr.
  
  - b) C.T. Fan No.K-4402 (Ammonia)  
 Checked, found OK and charged new oil - Servo System 526  
 Qty. : 50 ltr.
  
  - c) C.T. Fan No.K-4403 (Ammonia)  
 Checked and found OK. Charged new oil - Servo System 526  
 Qty. : 50 ltr.
  
  - d) C.T. Fan No.K-4404 (Ammonia)  
 Checked, found OK and charged new oil - Servo System 526  
 Qty. : 50 ltr.
  
  - e) C.T. Fan No.5, 6, 7, 8, 9  
 No defect was observed. New oil was charged.  
 Qty. : 50 ltr.



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Sr.No.	Job Description
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f) C.T. Fan No.K-4402 (Ammonia)

Removed centre shaft. Changed oil seals. Removed gear box, spare gear box positioned. Checked blade angle and alignment. Charged new oil - Servo system - 526. Qty : 50 ltr.

RAW WATER AREA

1. Raw Water Pumps - P-4101 A/B

- a) Overhauled the pumps.
- b) Changed both the bearings.
- c) New gland packing was provided.
- d) Pump A impeller neck ring was damaged, replaced a new one.

2. D.M. Water Pump - P-4202

- a) Overhauled the turbine.
- b) Carbon seals were changed.
- c) Bearings - 2Nos. were removed and changed.
- d) Attended the over speed trip assembly.

WATER TREATMENT AREA

1. Cation-I

- a) Resin was taken out.
- b) All acid outlet laterals and nozzels taken out.
- c) Service outlet nozzels taken out.
- d) Removed damaged rubber from acid outlet spools.
- e) New rubber coating was given to all acid outlet spouts.

Sr.No.

Job Description

- f) Put back all laterals, nozzels and acid outlet headers, and nozzels of service outlet.
- g) After vulcanizing the rubber, spark test and rubber hardness were taken. Defective spouts were rectified, checked and found OK.
- h) Resin was charged back.
- i) Following valves were repaired :
  - C<sub>1</sub>V<sub>3</sub> -- Hand wheel bearing was changed.
  - C<sub>1</sub>V<sub>12</sub> -- Made free the journal hard wheel.
- j) Service outlet line bottom bend was FRP coated from outside and inside.

2. Cation II

- a) Resin was taken out.
- b) Removed the damaged rubber from acid outlet spouts and from shell between service outlet and acid outlet header.
- c) All acid outlet laterals and nozzels were taken out.
- d) Service outlet nozzels were taken out
- e) Modified laterals, without nozzle arrangement and ceramic perforations inside, were fixed in place of old laterals/nozzel.
- f) New rubber coating was given to all acid out spout and shell.
- g) After vulcanizing the rubber, spark test and rubber hardness were taken and found OK.
- h) Resin was charged back.

Sr.No.	Job Description
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i) Following valves were repaired :

- C<sub>1</sub>V<sub>13</sub> - Bearing change.
- C<sub>2</sub>V<sub>5</sub> - Bearing change.
- C<sub>2</sub>V<sub>16</sub> - Made free the hand wheel.
- C<sub>2</sub>V<sub>17</sub> - Made free the hand wheel.
- C<sub>2</sub>V<sub>12</sub> - Made free the hand wheel.

j) Service outlet line bottom bend was FRP coated from outside and inside.

3. Cation-III

a) No defect in the Cation was reported.

b) Following valve was repaired.

- C<sub>3</sub>V<sub>2</sub> - Changed hand wheel bearing.

c) Service outlet line bottom bend was FRP coated from outside and inside.

4. Cation-IV

a) Opened the acid outlets header and top manhole cover.

b) Repaired the blinded laterals Nos. 1, 4 & 12 from Anion side.

c) Resin leak test was carried out and found OK.

d) Boxed up acid outlet header and top manhole cover.

e) Service outlet line bottom bend was FRP coated from outside and inside.

f) Following valves were repaired :

- C<sub>4</sub>V<sub>5</sub> - Hand wheel bearing was changed.
- C<sub>4</sub>V<sub>12</sub> - Hand wheel bearing was changed.
- C<sub>4</sub>V<sub>13</sub> - Hand wheel bearing was changed.

Sr.No.	Job Description
5.	<p><u>Anion-I</u></p> <p>Following valves were attended.</p> <p>A<sub>1</sub>V<sub>7</sub> - Made free the hand wheel.</p> <p>A<sub>1</sub>V<sub>8</sub> - Made free the hand wheel.</p>
6.	<p><u>Anion-II</u></p> <p>Following valves were attended.</p> <p>A<sub>2</sub>V<sub>7</sub> - Made free the hand wheel.</p> <p>A<sub>2</sub>V<sub>8</sub> - Made free the hand wheel.</p>
7.	<p><u>Anion-III</u></p> <p>Following valves were attended.</p> <p>A<sub>3</sub>V<sub>7</sub> - Made free the hand wheel.</p> <p>A<sub>3</sub>V<sub>8</sub> - Made free the hand wheel.</p> <p>A<sub>3</sub>V<sub>5</sub> - Hand wheel bearing was changed.</p>
8.	<p><u>Anion-IV</u></p> <p>Following valve was attended.</p> <p>A<sub>4</sub>V<sub>4</sub> - Hand wheel bearing was changed.</p>
9.	<p><u>PMB-I</u></p> <p>a) Opened both the manholes and taken out the resin.</p> <p>b) Repaired the alkaly outlet laterals No.1 and 5 from anion side.</p> <p>c) Charged back the resin and boxed up both the manhole covers.</p> <p>d) Resin leak test was carried out at a pressure of 3.5 kg/cm<sup>2</sup> and found OK.</p>

Sr.No.

Job Description

- e) Following valve was attended.  
 PMB<sub>1</sub>V<sub>6</sub> - Overhauled.
- f) Back wash mesh, new one, was fixed.
10. PMB-III
- a) Opened both the manholes and taken out the resin.
- b) Repaired the alkaly outlet laterals No.2, 4 & 5 from anion side.
- c) Charged back the resin and boxed up both the manhole covers.
- d) Resin leak test was carried out at 3.5 kg/cm<sup>2</sup> pressure and found OK.
- e) Following valve was attended.  
 PMB<sub>III</sub>V<sub>6</sub>
- f) Back was mesh - new one, was fixed.
11. SMB-I  
 Attended valve SMB<sub>1</sub>V<sub>6</sub> - Overhauled.
12. SMB-II  
 Attended valve SMB<sub>2</sub>V<sub>6</sub> overhauled.
13. SMB-III  
 Attended valve SMB<sub>2</sub>V<sub>6</sub> overhauled.
14. DM Water Pump - Motor Driven
- a) Pump was in a bad shape.
- b) Dismantled and overhauled the same.
- c) Changed both bearings - 2 Nos.

Sr.No.	Job Description
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- d) Checked impellers and shaft.
- e) Coupled and aligned.

BOILERS - F-5101 A&B

Service and maintenance of both boilers were carried out as mentioned below. First Boiler No.2 was offered for inspection and hydraulic test to Chief Inspector of Boilers, Gujarat State on 18-2-1977 and then the Boiler No.1 on 24-2-1977.

For Both Boilers

1. Put blinds to isolate boilers from main steam header blow-down header feed water header and associated gas lines. Removed all the boiler mountings.
2. Opened manholes of furnace, air heater, air ducts, and cleaned thoroughly the tubes of the furnaces.
3. Opened manholes of steam and mud drums, cleaned mud drum, boiler drum and boiler internals.
4. Cleaned all burners, checked relief valves and safety valves of steam drum and super heater, lapped seats of the safety valves properly. The valves were tested at the rated pressure.
5. Attended steam leaks.
6. Cleaned the Deaerator tank, cleaned the head and checked thickness. Checked all the trays.

For Boiler No.A

- a) Removed both air dampers for inspection and carried out maintenance jobs.
- b) Complete front plate was removed and new plate of 10 mm and 6 mm was fixed in burner portion.
- c) Manhole cover was completely repaired by casting new back plate and fabricated cover support.

Sr.No.

Job Description

- d) Modified design of refractory anchors were provided throughout the burner side plates.
- e) Attended the punctured water tube which was found to have leak at the time of hydraulic pressure test. Hydraulic test pressure at 90 kg/cm<sup>2</sup>.
- f) Side, middle and bottom plates of air damper chamber were cut out and new plates provided.
- g) Removed the old diffusers - 2 Nos. and provided new ones.

Refractory

- a) Complete refractory of front and top was removed.
- b) Refractory was poured as per manner given below :
  - i) Front wall - 10½" whytheat-A castable.
  - ii) Middle - 4½" Insulation brick.
  - iii) Back - 2" thick insulation block.
  - iv) Top roof - Refractory firecrete super was poured with new MS plate at the top.

For Boiler No.B

- a) Removed air dampers (top) for inspection and attended the necessary maintenance jobs on it.
- b) Cut out the old bent plates, half portion, from burner side. Welded one single plate of 17 mm thickness instead of earlier two pieces of plates.
- c) Provided additional anchor supports to the new plates.
- d) Cut out entirely the roof plates and provided new plates of 6 mm thickness.

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Sr.No.

Job Description

- e) Blinded the punctured tube No.7 of primary super heater, tested and found OK.
- f) Boiler was tested hydraulically at 90 kg/cm<sup>2</sup>.

COMPRESSOR HOUSE1. Instrument Air Compressor (K-5301)

- a) Taken the compressor for overhauling. Checked clearances of all bearings - big end and small end. Taken out crank shaft, pulleys and cross head. Removed the connecting rods. Disassembled the piston assembly 2nd stage piston rings in both stages were damaged. Changed the same.
- b) NRVs were checked, reconditioned and replaced. Removal all valves and replaced the same.
- c) Cleaned inter cooler and after cooler. Changed the position of the after cooler to outside the foundation area. Suction and discharge pipe lines were fabricated to suit new arrangement. After cooler piping was fabricated.

2. Plant Air Compressor (K-5302)

- a) Taken out the after cooler from the foundation placed it on the new foundation.
- b) Fabricated water cooling line, gas line.
- c) Cleaned the cooler.
- d) Replaced gasket to prevent flange leaks.



Sr.No.	Job Description
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EFFLUENT DISPOSAL AREA

1. Effluent Pump (P-4501/2)
  - a) Discharge valve flange had cracked. Repaired the same.
  - b) Replaced the pump for weak effluent from 160 M<sup>3</sup> to 380 M<sup>3</sup>. Previous pump Akay Alloy-20. Present Pump Akay Alloy-20.
  - c) Provided piping connection combined for the two pumps.

STEAM GENERATION

1. Boiler Feed Water Pump (P-5102 B)
  - a) Opened the casing.
  - b) Taken out diffuser, impellers and fixed back new assembly.
  - c) Attended turbine over speed trip.
  - d) Pump tried and tripped at 12600 RPM.
  - e) Cleaned oil cooler and filters.
  - f) Checked shaft trueness.
2. Boiler Feed Water Pump (P-5102 A)
  - a) Turbine over speed trip arrangement attended.
  - b) Pump tripped at 13200 RPM.
  - c) Cleaned oil cooler and filters.
3. F.D. Fan Turbines - (Q-5101 1 & 2)

Cleaned oil cooler and filters of fan turbines.

Sr.No.

Job Description

4. Deaerator Tank (V-5102)
- a) Check~~ed~~ all trays.
  - b) Checked all the thickness.

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INSTRUMENT JOBS

Offsites

Sr.No.	Job Description
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BOILERS

1. Panel Instruments

- a) All recorders, set point transmitters and controllers were taken out one by one. Its general cleaning of flapper-nozzle, restriction and various parts was carried out. Checked calibration and adjustment was done wherever it was necessary.
- b) All computing, derivative, ratio and sumation relays were also taken out one by one and after general cleaning its calibration was carried out and fixed it back.
- c) Air filters and regulators of main air header in control room were removed, overhauled and fixed back.
- d) Removed all panels receiver pre. gauges, checked its calibration and fixed back.
- e) Checked calibration of draught gauges and blow off impulse lines with air.

2. Peabody Panels

- a) Gas block valve BLK-1 of burner No.2 was got jammed so it was opened out and overhauled in Instrument workshop checked its performance and fixed back.
- b) Rest all block valves general cleaning and greasing was done on line and their performance was checked with air supply.
- c) All solenoids for gas block valves and oil shutoff valves were checked and all connection in junction were tightened.

Sr.No.

Job Description

- d) All relay trays of both boilers were taken out and general cleaning was carried out.
- e) By passed flame failure trip in boiler No.1 and kept only flame failure alarm in circuit.
- f) Low air flow and purge air flow switches of both boilers were removed, overhauled, calibrated and fixed back.
- g) Extra low level switches of both boilers were opened out, Checked and cleaned.
- h) Low oil pressure switches of both boilers were removed calibrated and fixed back with new glycol.
- i) Both ignitors removed and tested in Instrument shop and were kept ready.

3. PICY 5151

- a) This valve was opened out from bonnet and brought to the Instrument workshop while checking following various parts were found worn out and eroded.

Plug with stem, seat, case, linear, guide bushes, guide tube, gland tightener, studs etc.,

All above parts were prepared in our Mechanical Workshop from 316 S.S. and valve was reassembled after checking the dimensions of all above parts. New gland was packed with graphited asbestos reinforced by s.s. wire, stroke was checked and it was adjusted for full stroke length.

- b) Direction of valve body changed to original condition (row steam inlet from top side)
- c) Valve was fixed back with new gaskets and its stroke was checked from control room.

4. Field Instruments

- a) Air filter regulators and air shelt off valves of all transmitters were overhauled and greased. Some pressure gauges were replaced wherever it was necessary.

Sr.No.	Job Description
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- b) Replaced new air filter regulators for both oil flow control valves.
- c) Replaced steam-tracing coils on both oil flow transmitters reservoirs near orifice plate by closed coiling (with more spherical twins) giving 14 ATA steam. As LSHS oil was getting (jammed) freezeed in particularly cold season.
- d) 14 ATA control valve was removed completely overhauled in Instrumentation shop and fixed back.
- e) 14 ATA pressure controller replaced by new controller having PB and reset action both (442R). It was having only proportional action.
- f) Calibrated oil flow transmitters of both boilers.
- g) General cleaning and checking was carried out for feed water flow, steam flow, drum level, pressure and temperature transmitters.
- h) All field controllers instruments were checked, cleaned and synchronised.
- i) BLR-2, three element level transmitter's manifold completely modified with new ½" dia. S.S. valves and ¼" dia. S.S. tubing.
- j) BLR-2, Feed water control valve's gland was leaking, put additional layers of packing and tightened.
- k) Provided new thermocouple with extension cable upto temperature indicator in control room for measuring primary outlet superheating steam temperature on both the boilers.
- l) Calibrated field pressure gauges and replaced wherever it was necessary.

1. Air Dryer

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Silica jel from both chambers were taken out sieved it, seperated, activated alumina and filled one chamber with same silica jel while other chamber was filled with new Indian make silica jel for trial basis. But after some days lot of dust and sand was found in filters cups in Urea and boiler plants so again dryer was stopped removed new silica jel and failed with original silica and new activated alumina balls.

2. Lube oil alarm and trip switches contacts were cleaned with CTC and checked performance on line itself for both instrument Air Compressor and plant air compressor.
3. Loading and unloading pressure switches of both compressors were checked and cleaned.
4. Nitrogen pressure controller was not working properly opened out its flapper nozzle assembly, removed choking from nozzle, aligned and put in line.

COOLING TOWERS

1. Air filter regulator and air isolation valve for sump level transmitters were replaced by new one.
2. Transmitter was brought to Instrument Shop and calibrated in new range for 8" of water to bring down the operating level indication at 50% of controller for better and smooth control action.
3. Changed the location of transmitter by about 8% up from original location.
4. Changed the impulse line to suit the height of transmitter.
5. Overhauled air filter regulator of control valve and checked the smoke.
6. Provided some isolation valves for impulse line of pressure gauges and changed the tubing by  $\frac{1}{4}$ " dia. S.S.

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Sr.No.	Job Description
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INERT GAS PLANT

1. Air Dryer

Silica jel from both chambers were taken out sieved it, seperated, activated alumina and filled one chamber with same silica jel while other chamber was filled with new Indian make silica jel for trial basis. But after some days lot of dust and sand was found in filters cups in Urea and boiler plants so again dryer was stopped removed new silica jel and failed with original silica and new activated alumina balls.

- 2. Lube oil alarm and trip switches contacts were cleaned with CTC and checked performance on line itself for both instrument Air Compressor and plant air compressor.
- 3. Loading and unloading pressure switches of both compressors were checked and cleaned.
- 4. Nitrogen pressure controller was not working properly opened out its flapper nozzle assembly, removed choking from nozzle, aligned and put in line.

COOLING TOWERS

- 1. Air filter regulator and air isolation valve for sump level transmitters were replaced by new one.
- 2. Transmitter was brought to Instrument Shop and calibrated in new range for 8" of water to bring down the operating level indication at 50% of controller for better and smooth control action.
- 3. Changed the location of transmitter by about 8% up from original location.
- 4. Changed the impulse line to suit the height of transmitter.
- 5. Overhauled air filter regulator of control valve and checked the smoke.
- 6. Provided some isolation valves for impulse line of pressure gauges and changed the tubing by 1/4" dia. S.S.

Sr.No.	Job Description
7.	Provided many new temperature indicators at various points on cooling water turbines bearing and gear boxes.
8.	Chlorinator unit was completely overhauled. Changed two PVC tubing also.
9.	Checked the tripping system of low lube oil of motor driven pump.
10.	Calibrated lube oil pressure and water discharge pressure gauges.
11.	Removed lube oil pressure switch of turbine No.1, calibrated and fixed back.
12.	Calibration of both Urea and Ammonia pH meters were checked.

#### AMMONIA STORAGE AREA

1. Low lube oil alarm pressure switch PLA 3102 was opened out for checking, lot of water was found inside. It was dried, cleaned with naptha, calibrated and fixed back.
2. Low lube oil pressure cutout switch PLCO-3103 general cleaning and calibration was carried out and closed.
3. High temperature alarm switch 3104 was opened out overhauled, checked performance and fixed back.
4. High ammonia pressure discharge alarm switch PHA 3111. Its impulse line was leaking from joints opened out. The complete impulse line replaced flange gasket and fixed back, checked performance of switch also.
5. Replaced some annunciator window bulbs.
6. Cleaned behind the panel and some unwanted wires were removed and dressed properly.
7. Level controllers LC-3101 and 3102 overhauled regulators. General cleaning and performance was carried out checked the strokes of valves.



Sr.No.	Job Description
8.	Ammonia storage tank pressure controller PIC-3104. Cleaned flapper, nozzle and aligned controller, flushed the impulse line, overhauled its regulator also and stroking of valve was checked.
9.	Ammonia high level alarm switch was opened, cleaned its contact with CTC and checked performance of contacts.
10.	Ammonia storage tank vapour pressure transmitter, overhauled its regulators, cleaned flapper-nozzle, flushed impulse line and checked performance.
11.	Ammonia storage tank level indicators's cleaning was alone.
12.	Low Ammonia flow trip receiver switches were by passed during shutdown.
AMF Set	: Removed one pressure temperature switch, calibrated in shop and fixed back with some modification of impulse line, provided shut-off valve and drain provision. Performance was checked by running of AMF set.
pH Meters	: Effluent Urea (West side) changed its location, removed all electrodes from line and kept in Workshop. Mechanical people were going to modify pipe line.

#### D.M. PLANT

1. Removed air filter regulators of main air header overhauled them and fixed back.
2. Cation III inlet rotameter was removed its broken tube was replaced by new one assembled it and fixed back.
3. D.M. Water rotameter (Cation outlet) was removed for cleaning purpose. Cleaned it with Hcl and fixed back.
4. D.M. Water buffer tank's level controller, general cleaning was carried out, checked alignment and checked stroke of valve also.

Sr.No.	Job Description
5.	Degasser level controller aligned and checked stroking of valve.
6.	Raw water pressure controller's overhauling was carried out and aligned the controller.
7.	Raw water control valve cleaned, greased its all parts, checked its auto-manual operation from hand jack as well as from controllers.
8.	Cooling water make-up level controller cleaned, aligned and checked the stroke of control valve.
9.	Anion III shut off valve's old diaphragm was replaced by new one.
10.	CIV VI : Gland was leaking so it was replace by new teflon rope packing.
11.	Cation VI : Diaphragm was punctured so it was replaced by new 8" size diaphragm.
12.	All field 440K model controllers were cleaned and painted.
13.	All field air pressure regulators were overhauled and greasing was done.
14.	Replaced all three Hcl storage tank level transmitters by new one and replaced tubing also.
15.	Air supply system for above transmitters modified.
16.	General cleaning behind the panel was carried out.

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INSPECTION REPORT

Offsite

1. Spark Test

Spark test was carried out on the following rubber lined vessels.

- a) Cation No.1 & 2.

Results

Four defective spots were found in cation No.1 and six numbers of defective spots were found in cation No.2. In both the vessels these spots were repaired re-tested and found OK.

Equipment used

High frequency high voltage spark tester.

2. Visual Inspection

Visual inspection was carried out on the following vessels :

- a) Mud drums of boiler No.1 & 2.
- b) Boiler steam drum of Boiler No.1 & 2.
- c) Deaerator (V-5102)

Results

Mud drums found OK. Boiler steam drum of Boiler No.1 found OK. Boiler steam drum of boiler No.2 found OK except demister pad which came out in one place and was rectified with an additional support. Number of bolts nuts and washers found lying inside the Deaerator. Maintenance people have to put back these in position. There is no indication of corrosion of shell and head. Measured thickness values agree favourably with design values.

3. Thickness Survey

Thickness measurements were carried out on the following pipe-lines.

- a) Super heater tubes in both the boilers at random.

- b) Boiler tubes (out side bends and in straight portion of inside tubes) in both the boilers.
- c) Air pre-heater coils in both the boilers.
- d) Super heater steam line from boiler to 60 ata header in both the boilers.

Results

Recorded.

Equipment

IMECO Ultrasonic thickness gauge UTG 101 Accuracy  $\pm$  4%.

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SHUTDOWN JOBSCivilOffsite

Sr.No.	Job Description	
1.	<u>Cooling Tower (H-4401)</u> Repairs of cooling tower wood work.	Work done departmentally as per instruction of Exon Engineers, Bombay.
2.	D.M. Water tank Civil repairs plastering and painting with lear epoxy	Departmental Work.
3.	<u>Water Treatment Plant</u> 25 mm thick bitumastic lining work in PMB and SMB area floor in W.T. Plant.	Work done by M/s. Chemisight Engineers, Baroda (Time - 10 days)
4.	<u>Boilers - F5101 A&amp;B</u> a) Refractory work in Boiler No.1 and 2. Burner block face done with castable refractory whytheat A. b) Repair of one foundation underneath mud drum at Boiler No.1 c) Repairs of blow down sump between two B chimmeies.	Departmental work as per instructions of ACC's Engineer.  Departmental work.  Work done by CC Mistry
5.	<u>Painting Work</u> a) Boiler plant steel structure and duct etc. and cooling tower fans etc. b) Cooling Tower sumps pit area etc.	Work done by M/s.B. Chaunan & Co., Kalol.  Departmental work.

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BAGGING & MATERIAL HANDLINGMechanical

Sr.No.	Job Description
1.	<u>M 2110 Plant Transformer Conveyor</u> i) Replaced one bearing on head pulley. ii) Checked, repaired and replaced the damaged rollers. iii) Checked coupling bolts and bushes. iv) Checked up and repaired the skirt rubber. v) Overhauled the gear box.
2.	<u>M 2112 Fresh Urea Shuttle Conveyor</u> i) Checked up coupling bolts. ii) Checked bearings. iii) Checked rollers. iv) Overhauled the gear v) Repaired skirt rubbers vi) Checked up tripper unit (M 2114)
3.	<u>M 2117 Reclaim Conveyor</u> i) Checked rollers, bearings and coupling bolts. ii) Overhauled the gear box.
4.	<u>M 2121 Bagging Building Feed Conveyor</u> i) Checked rollers. ii) Checked bearings and couplings. Replaced one bearing on tail end. iii) Overhauled the gear box.

Sr.No.	Job Description
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5. M 2122 Bagging Building Hopper Conveyor
  - i) Checked coupling, bearing and rollers.
  - ii) Overhauled the gear box.
  - iii) Checked and repaired skirt rubbers.
  - iv) Repaired belt joint.
  - v) Cleaned, checked and regreased the moving tripper.
  
6. Complete greasing of all conveyors and replacement of oils have been done.
  
7. M 2116 Reclaim Machine with Conveyor
  - i) Removed the damaged shaft of scraper chain drive and installed a new one. Replaced all the 10 Nos. bearings. 8 Nos NA 4824 and 2 Nos NKI 95/36
  - ii) Removed the damaged shaft of bucket elevator. Rectified the shaft by building up and remachining. Installed all new bearings.
  - iii) Gear train 4 Nos. for bucket elevator were rectified and installed.
  - iv) Replaced swivel pins.
  - v) Replaced oil in all gear boxes.
  - vi) Checked alignment of all couplings.
  - vii) Inspected wire ropes.
  
8. M 2101 Bagging Machine
  - i) Overhauled the packer scales and modified the pivot valve support.
  
9. Delumper
  - i) Checked and replaced the bearings at both ends.

Sr. No.	Job Description
10.	<u>M 2124 Slat Conveyor</u> i) Replaced the broken slats of all 8 conveyors. ii) Checked lubrication of all drives. iii) Checked lubrication of all tail ends.
11.	<u>M 2111 Two Way Feed Hopper</u> Made the flapper free.
12.	<u>P3102 1/2 - Ammonia Loading Pump</u> Tapped and provided drain valves after NR valve on discharge line.
13.	<u>H 3101 - Ammonia Condenser</u> Cleaned the Ammonia condenser.
14.	<u>P 3302A - Naphtha Feed Pump</u> Replaced mechanical seals.
15.	<u>K 3101 - Ammonia Refrigeration Compressor</u> i) Changed piston rings - both stages. ii) Changed stuffing box packing - both stages. iii) Replaced valve cover 'O' rings - both cylinders. iv) Replaced valve gasket - both cylinders v) Overhauled force feed lubricator. vi) Checked alignment. vii) Replaced crank case oil.
16.	Repaired and tested isolation and relief valves.
17.	<u>Loading Arm No.1</u> Attended leak from gland and flange, isolation valve of minimum flow line.





SHUTDOWN JOBSCivilBagging and Material Handling

Sr.No.	Job Description	
1.	<u>Painting work</u>	
	a) Belt conveyor from P.T. to silo No. M-2110 supporting structure Epoxy Grey paint.	Work done by M/s.B. Chauhan & Co.,
	b) Belt conveyor No.M-2112 inside silo top supporting structure.	-do-
	c) Belt conveyor reclaiming belt inside silo support structure.	-do-
	d) Belt conveyor from transmission tower to bagging plant hoppers	Departmental work.
	e) Repairing of hoppers.	-do-
	f) Painting of hoppers	-do-

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E L E C T R I C A L

Ammonia

Urea

Offsites

B&MH

1. 66 KV Switchyard

- a) The bushings of 8 MVA transformer was thoroughly cleaned. OLTC was thoroughly inspected by M/s.C.T.R, Poona representative and the following parts were replaced.
  - i) Resistor plates.
  - ii) Moving contacts.
  - iii) Fixed contacts.
  - iv) Oil of the OLTC tank.
  - v) The transformer was meggered.
  - vi) Ratio and S.C. test were carried out to check healthiness of the transformer.
- b) Oil samples of the following equipments were tested for dielectric strength.
  - i) 8 MVA transformer.
  - ii) OLTC
  - iii) 66 KV OCB
  - iv) PTS
  - v) 11 KV OCB for MPSS.
- c) All protective relays mounted on CRP were tested by AEC, A'bad relay testing group for their satisfactory operation.
- d) 11 KV OCB for MPSS was overhauled.
- e) All inter locks were also tested.

2. 11 KV Distribution System

a) MPSS

- i) All bus-bar chambers and bus bars were cleaned and connections were checked for their tightness.
- ii) All breakers were overhauled. OCB oil samples were tested for dielectric strength and replaced wherever necessary.
- iii) All relays were tested by applying secondary injection by AEC relay testing group for satisfactory operation and tripping of breakers were checked by manual operation of relays.

b) Transformer

Oil samples of all transformers were tested for dielectric strength and megger tests on transformers were carried out. LT cable connections were checked for proper tightness.

3. LT Distribution Systems

a) Air Circuit Breakers

Air circuit breakers of all MCCs were overhauled, checked and tested for satisfactory operations.

b) Relays

Relays of all MCC's were tested by applying secondary injections and by AEC Company for their satisfactory operations.

c) Busbar Chambers

All MCCs busbar chambers were thoroughly cleaned, all connections were checked for thorough tightness and busbars were meggered. Original bakelite/melamine supports which have a better dielectric properties and higher temperature with stand capacities.

supports for vertical bus-bars were replaced by

In MCC-4, 4A & 8 these supports could not be replaced due to shortage of material.

- d) Maintenance of all feeder trolleys were carried out as per IFFCO proforma . Jobs were completed.
- e) Direct operated BMRs of all motors rated more than 50 HP were replaced with C.T. operated BMRs.

4. Miscellaneous

- a) All motors were megger tested and their valves recorded.
- b) Earth resistance of all earth stations was measured and the values recorded.
- c) The following motors were overhauled :
  - i) Condensate pump No. A of Urea Plant.
  - ii) Motor - NaOH unloading pump - P-4205.
  - iii) Motor - Borewell No.9
  - iv) Motor - NH<sub>3</sub> Circulating Pump - P-3103/A.
  - v) Motor - Day Tank Fuel oil charge pump - F-5105 A/B.
  - vi) Motor - Soot blower No.4 for Boiler No.F-5101/2  
This motor was completely rewound.
- d) 1350 HP motor for cooling water pump after rewinding was placed on the foundation and commissioned. The motor brought from M/s. F.C.I, Sindri for the above equipment was returned back to them.
- e) The AMF set was taken up for thorough cleaning, checking up of all connections in the alternator terminal box and meggering.
- f) A permanent fuse unit was installed near the control panel of fire hydrant panel to facilitate the change over of emergency power for fire hydrant pump.
- g) Individual fuses were provided for soot blower motors of Boiler No.1 & 2.
- h) All packer scale control panels, magnets and various associated control gears were thoroughly overhauled.

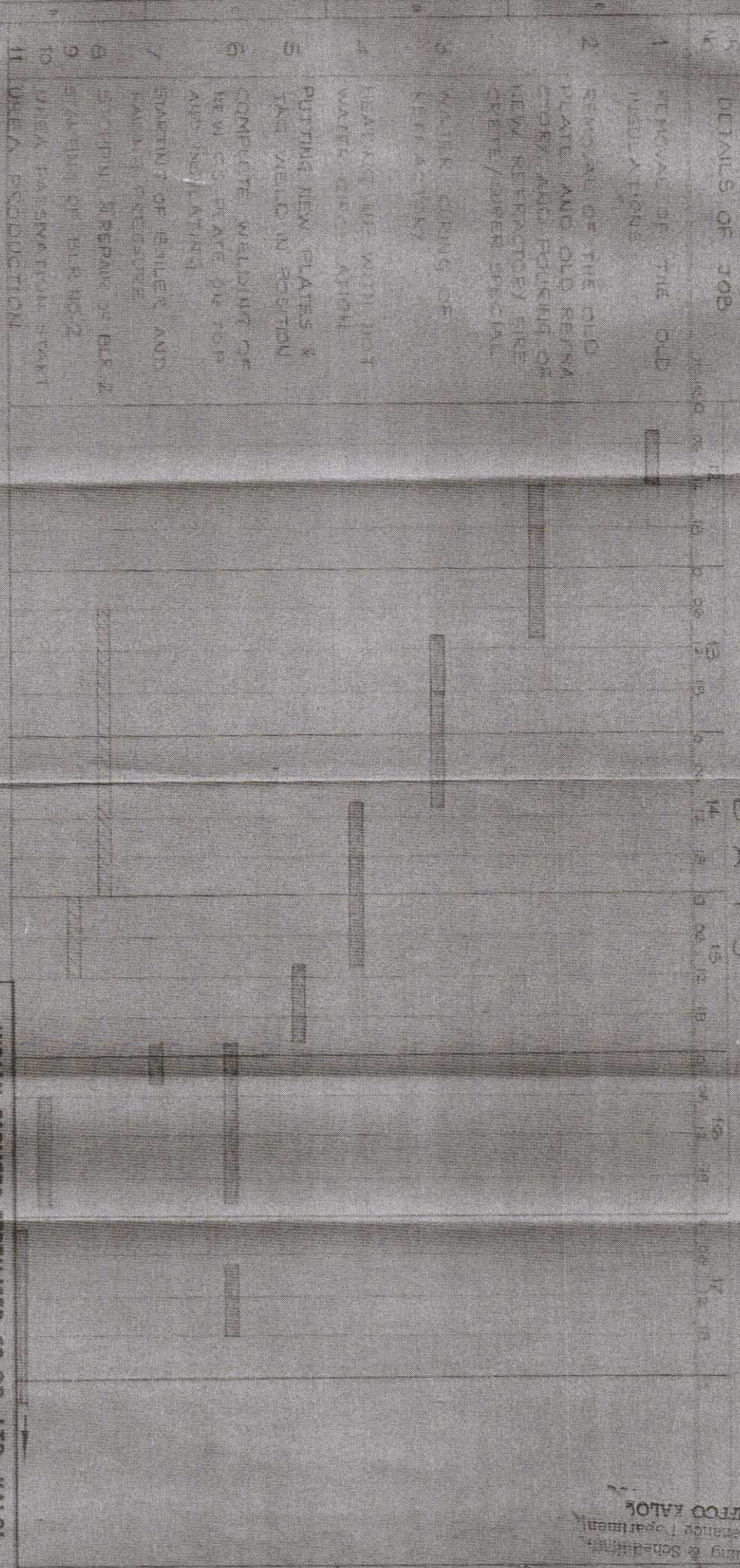
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BAR CHART SHOWING THE REFRACTION  
REPAIR WORK ON ROLLER NO. 1.

Planning & Scheduling  
M.

LFCO KALOL

Planning & Scheduling  
Maintenance Department  
LFCO KALOL



ENTERED BY: [Name] AT: [Location] ON: [Date]  
 APPROVED BY: [Name] AT: [Location] ON: [Date]  
 1. DETAILS OF JOB  
 2. REMOVAL OF THE OLD WELD ALONGS  
 3. REMOVAL OF THE OLD PLATE AND OLD REFRACTION AND POSITION OF NEW REFRACTORY FIRE CLAYE / LAMER SPECIAL  
 4. WATER BORING OF AREA  
 5. HEATING OF THE WELDING WARE  
 6. PUTTING NEW PLATES & TAG WELD IN POSITION  
 7. COMPLETE WELDING OF NEW CO. PLATE ON TOP AND INSULATING  
 8. STARTING OF ROLLER AND SAMPLING TESTS  
 9. STOPPING OF ROLLER  
 10. CHECK FOR SMOKE FROM WARE  
 11. CHECK FOR SMOKE FROM WARE  
 12. DETAILS OF JOB  
 13. REMOVAL OF THE OLD WELD ALONGS  
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 19. STARTING OF ROLLER AND SAMPLING TESTS  
 20. STOPPING OF ROLLER  
 21. CHECK FOR SMOKE FROM WARE  
 22. CHECK FOR SMOKE FROM WARE

**INDIAN FARMERS FERTILISER CO-OP. LTD. KALOL**

NAME: [Name] DATE: [Date] PLANT: [Plant] EWR NO: [EWR NO.]

SHEW: [Name] DATE: [Date] PLANT: [Plant] EWR NO: [EWR NO.]

SCALE: [Scale]

DRAWING NO. [Drawing No.]

PLANT: [Plant] EWR: [EWR] NUMBERS: [Numbers] SHEET: [Sheet] REV: [Rev]