

STENCH

/IFFCO/
KALOL UNIT

P & S Section
Maint. Deptt.

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REPORT

ANNUAL TURNAROUND - ¹⁹⁸⁴ 1981

13.4.1981 - 10.5.1981

1.1.1984 - 25.11.1984

INDIAN FARMERS FERTILISER COOPERATIVE LIMITED

61181

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ANNUAL TURNAROUND - 1981

GENERAL

Sr. No.	Category	Quantity
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1 Equipment utilised

✓ (A)

IFFCO

65 Tonnes HM Crane	-	1
15 " Coles Crane	-	1
18 " Tata Crane	-	1
3 " Forklift	-	2
2 " Forklift	-	1
Truck	-	2
Generator Welding Set	-	8
Transformer Welding Set	-	3
Diesel Generator	-	1
Air Compressor Centrifugal portable	-	1

(B) Hired

✗ Trucks - 01

Forklift

Sr. No.	Category	Quantity
2 ✓ (A)	<u>IFFCO Departmental</u> :	
	(a) <u>Mechanical</u> :	
	Technician	- 44
	Rigger	- 07
	Mazdoor	- 11
	(b) <u>Mechanical Services</u> :	
	Technician	- 38
	Welder	- 07
	Mazdoor	- 16
	(c) <u>Electrical</u> :	
	Technician	- 23
	Mazdoor	- 02
	(d) <u>Instrumentation</u> :	
	Technician	- 23
	Mazdoor	- 01
(B)	<u>IFFCO Kandla</u> :	
	Engineer	- 01
	Fitter	- 01
	Rigger	- 01
	Welder	- 01
(C)	<u>IFFCO Phulpur</u> :	
	Engineer:	- 01
(D)	<u>KRIBHCO - SURAT</u> :	
	Engineers	- 07
(E)	<u>Hired</u> :	
	Welder	- 06
	Grinder	- 12
	Fabricator	- 03
	Rigger	- 10
	(including 2 from GSFC)	.

A special mention about manpower supplemented by trainees available during shutdown is quite relevant. We had 24 Nos. of trainees in maintenance, in various trades.

Some important jobs executed during turnaround

Plant	Details of work	Party executing the job
<u>Ammonia</u>		
01	Bently Nevada Probe Installation	Representative of Bently Nevada USA and
	Air compressor 101 - J	Departmental
	Synthesis Gas compressor 103-J	
	Refrigerant compressor 105 - J	
	Compressor Turbine Trains for compressors	
	Gear box	
	H.P. case	
	L.P. case	
02	Primary Reformer - 101-B	
	Header replacement	Simon Carves India Ltd,
	Header preparation and inspection	Departmental
03	Naphtha N.G Burners replacement-101-B	Simon Carves India Ltd.
04	Silencer SP-73	Simon Carves India Ltd.
05	Catalyst replacement 101 - B	Techno Engineering Baroda and Departmental
06	Catalyst replacement 104-D	Manohar Construction, Baroda.
07	Clean all the Heat Exchangers of NH ₃ Plant	Manohar Construction, Baroda
08	Inspection of Boilers 101-CA/CB, 112-C	Inspected & approved by CIB, Gujarat.

Plant	Details of work	Party executing the job
-------	-----------------	-------------------------

Urea :

- | | | |
|----|--|---|
| 1. | CO ₂ compressor
(Reciprocating) - K 1101/2

Replacement of suction
vessel | Departmental |
| 2. | CO ₂ Stripper - H 1201 | Stamicarbon special-
list from France for
checking ID of tubes;

Cleaning of ferrules
Departmental |
| 3. | Autoclave V - 1201

Inspection & cleaning | Stamicarbon

Specialist and
Departmental |
| 4. | HP Condensor H 1202
Inspection | Stamicarbon
specialist, and
Departmental |
| 5. | Inspection of Boilers
V - 1501 | Inspected & approved
by CIB |

Plant	Details of work	Party executing the job
-------	-----------------	-------------------------

OFFSITES :

- | | | |
|----|-----------------------|--|
| 1 | Cation III & | Pan Elasteners, A'bad |
| | Cation IV | Industrial linings,
Baroda. |
| | Re-rubber lining | |
| 2. | Inspection of Boilers | |
| | F 5101 / A | |
| | F 5101 / B | Inspected & approved
by CIB, Gujarat. |

Annual Turnaround - 1981

Ammonia Plant

Mechanical

Code No.	Description
----------	-------------

1 01 01	<u>Catalyst replacement</u>
---------	-----------------------------

Primary Reformer 101 - B

Earlier it was proposed to change catalyst of primary reformer tubes only of those tubes which were affected by header replacement (186 tubes)

However catalyst of all the reformer tubes were replaced. The job was done departmentally.

1 01 02	<u>Catalyst replacement</u>
---------	-----------------------------

Shift Converter - 104 - D

HTS Catalyst and LTS catalyst

Changed catalyst - HTS & LTS

1 02 01	<u>Air Compressor - 101 - J</u>
---------	---------------------------------

01 The compressor- H.P. Case, L.P.-Case, Turbine Gear Box were decoupled for installation of vibration monitoring probes in the bearings. The earlier probes were by Reliance and new ones now installed are by Bentley Nevada, U. S.A.

In so far as mechanical maintenance is concerned the jobs were done as mentioned below :

Code No.	Description
----------	-------------

1 02 01
(Contd) 02

Decoupled the following :

- (a) Turbine to LP case coupling
- (b) LP case to Gear box coupling
- (c) Gear box to H.P. case coupling

Opened all the bearing covers,
taken out gear box covers.

03

H.P. Case :

Bearing clearances were taken and
recorded.

Outboard bearing

R' clearance - 0.006 - 0.007 inch.

R' clearance - 0.008 - 0.009 inch.

Rotor thrust - 0.074 inch.

04

Gear box :

Gears were cleaned. Bearing cover
leak was attended by lapping of
the cover.

Bearing clearances were measured.

Code No.

Description

1 02 01
(Contd)

Bearing (coupling to HP case)

0.007 inch.

0.007 inch.

Bearing (coupling to LP case)

0.009 inch.

0.009 inch.

Thrust of both gears - 0.013 inch.

05

Top cover was opened

Labyrinths taken out as it was obstructing instrument probe.

L.P. case thrust was found excessive compared to recommended. Thrust adjusting shims new ones got made in workshop, and put in.

Old adjusting shims

<u>Inner</u>	<u>Outer</u>
I.D. - 120 mm	I.D. - 190 mm
O.D. - 196 mm	O.D. - 196 mm
Thick - 0.385 inch.	Thick - 0.350 inch.

Code No.	Description
----------	-------------

1 02 01
(Contd)

New adjusting shims :

	<u>Inner</u>	<u>Outer</u>
I.D. -	120 mm	I.D. - 120 mm
O.D. -	196 mm	O.D. - 196 mm
Thick -	0.391 inch.	Thick- 0.356 inch.

Earlier thrust clearance - 0.025
inch.

Thrust after new shims - 0.013
inch.

Both bearings boxed up

R' clearance

Gear box side - 0.010 inch.

Turbine side - 0.009 inch.

06

Turbine 101 - JT :

Turbine Inboard bearing cover -
lapping was done checked the
blue impression & found O.K.

Clearance between OST bolt and
push button 0.125 inch.

Overspeed trip knob fixed back in
position

Code No.	Description
1 02 01 (Contd)	Bearing clearance Governor side - 0.011 inch. Coupling side - 0.010 inch.
07	<u>Governor</u> : Governor oil leakage. Governor power piston was taken out and got machined in workshop. Power piston was placed in position. Spare used : 'O' ring size ID - 31.1 mm
1 02 02	<u>Refrigerant compressor - 105 - J</u> :
01	It was proposed to over-haul the turbine. Another job was installation of new probes.
02	Removed Turbine rotor and cleaned by sand blasting. Diaphragms 1,2, 3 & 6 were taken out and cleaned by sand blasting. Earlier it was proposed to take out and clean all diaphragms, however silica deposit was not much and that too was not on all the diaphragms. Hence others not taken out. Rotor inspected by dye check. Outboard bearing thrust adjusting shims were made in workshop <u>New shims</u> : Thick - 0.124 inch. I.D. - 86.00 , O.D. - 155.5 mm

Ammonia : Mechanical

Code No.	Description
1 02 02 (Contd)	<p>Thrust after new adjusting shim 0.011 inch.</p> <p>Roused gimple valve. Fixed hydraulic trip assembly in position clearance between OST bolt and hitting knob - 0.124 inch</p> <p>Governor piston was taken out and got machined in workshop. Power piston of governor put in position with new 'O' ring size 31.1 mm. In nozzle valve lift bar assembly sleeve was found shorter than the height of lift bar and the same was made in our workshop & installed.</p> <p>Lenght of sleeves :</p> <p>103 - J side : 2.761 inch</p> <p>101 - J side : 2.758 inch</p> <p>Measured the distance from lifting bar to top inner surface, found more by 1.5 mm towards 103 - J side than the other spindle of lifting bar. Maintained distance 149.9 mm.</p>
1 02 03	<p><u>Synthesis Gas Compressor 103 - J :</u></p> <p>01 Bently Nevada new probes on bearings by instrument as proposed, were installed.</p> <p>02 Opened bearings. Decoupled compressors - turbines trains. Clearances were maintained as under :</p> <p><u>HP case :</u></p> <p>Inboard bearing ... 0.005 inch to ... 0.006 inch</p> <p>Thrust bearing ... 0.016 inch</p>

Ammonia : Mechanical

Code No.

Description

1 02 03
(Contd)

LP case :

Turbine side ... 0.006 inch to
0.007 inch.

Thrust ... 0.011 inch.

Turbine Drive - 103 JAT :

Damaged pads of journal bearing
compressor side replaced (5 Nos.
bearing shoes No. GP 395 M.).
Damaged pads of turbine side
journal bearing were replaced
(2 Nos. bearing shoes No. GP 395
R.), replaced thrust shoes
(set of six pads).

New thrust adjusting shims were
made in workshop

New shim :

Old shim :

I.D. - 118 mm. .. 118 mm

O.D. - 212 mm. 212 mm

Thickness - 0.248
inch. 0.241 inch.

Measured Thrust. 0.0115 inch.

Changed steam traps. Steam inlet
valve of gland condenser was re-
placed. Sentinel valve tested in
work-shop to 41 kg/Cm² and fixed
back. Replaced P.1 tapping valve
by 3/4" 1500 SW gate valve.

Ammonia : Mechanical

Code No.

Description

1 02 03
(Contd)

Turbine Drive - 103 JBT :

It was planned to take out rotor and diaphragms and clean the same. Inspection of 105 - JT revealed not much silica deposit, it was decided not to open turbine.

Removed the governor and bearings, Oil guard of thrust bearing scraped and put back. M seal provided at an elbow of inboard bearing oil line.

Clearances of bearings.

Governor side ... 0.010 inch.

Coupling side ... 0.011 inch.

Thrust measured ... 0.014 inch.

1 02 04

BFW Pumps & Turbines - 104-J/JT &
104-JA/JAT

Preventive Maintenance :

Turbines were taken up for preventive maintenance. Inspected bearings and checked alignment.

Seal of Terry Turbine was reported leaking as moisture was found going into the lub oil. This was attended.

104 - JA check valve was replaced with modified NRV - minimum flow cum check valve. Attended also

Ammonia : Mechanical

Code No.	Description
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1 02 04
(Contd)

the discharge line of NRV drain.
L.O. Pump alignment was done.

1 02 05

I.D. Fan - 101 - BJ :

Rotor for uprating the ID Fan performance was installed in Jan/Feb. 1981. Earlier, rotor diameter was 78.75 inches while the present ~~was~~ is of 92.00" diameter. In the current Annual Turnaround it was inspected.

The clearance at suction eye of the rotor had increased, Welded 1 inch flat sheet to the suction eye to minimise the clearance.

Block was repaired. Boxed up D/S and U/S flanges with new gaskets 4"-400 flexitallic.

Auxiliary oil pump 101 - BJ was aligned.

Code No.	Description
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This job had been discussed threadbare vetted and planned in advance. The material like welding sets, grinders, grinding wheels, electrodes etc had been ensured in advance. Parts that needed fabrication and machining, were kept in hand. Special group of engineers and technicians was detailed about the job. The contractors - M/s Siman Carves India Limited, Bombay, were explained about their scope of work - their skilled labour having been trade tested before hand.

This was a critical job and was handled as such, the pay off for proper planning was that the job was completed well in time. The mechanical portion relating Primary Reformer job was completed on 26.4.81 instead of 2.5.81 as scheduled. Thereafter civil job and insulation work was taken up and this completed by 28.4.81. The job was finished, clear 4 days in advance of IFFCO schedule.

Ammonia : Mechanical

Code No.	Description
1 03 03	<p><u>Header block valve :</u></p> <p>It was proposed to change the header block valve</p> <p>Lapped the following Naptha needle valves.</p>

<u>Row No.</u>	<u>Burner No.</u>
2	14
3	14
6	14
8	13

Replaced the gland of following valves :

<u>Row No.</u>	<u>Burner No.</u>	<u>Row No.</u>	<u>Burner No.</u>
3	11,1	8	1,5,8,9,12,14
5	5,6,1	9	3,4,12,14,1
7	13,12,5		

Provided hand wheels for following valves :

<u>Row No.</u>	<u>Burner No.</u>	<u>Row No.</u>	<u>Burner No.</u>
6	3	8	7

Ammonia : Mechanical

Code No.

Description

1 03 03
(Contd)

Stopped the steam leak of following burners by providing teflon tapes.

<u>Row No.</u>	<u>Burner Nos.</u>	<u>Row No.</u>	<u>Burner Nos.</u>
4	7,9	7	2
2	13	8	5
5	6	9	11

Straightened the Burner No.1 of row No.7.

1 03 04

Cleaned the Naptha strainer

The following pilot burners were cleaned.

<u>Row No.</u>	<u>Burner No.</u>	<u>Row No.</u>	<u>Burner No.</u>
7	13,14	5	7
8	13	4	5
9	1,10	3	10
6	1,2,3,4	2	9,10
		1	9

1 03 05

Air Resistor - 101 - B

It was proposed to make operable all primary & secondary air resistors of the arch burner of reformer.

Ammonia : Mechanical

Code No.	Description
1 03 05 (Contd.)	Repaired the following air resistors.
	6,11,12 Row No.1 (Primary)
	4,7,12 Row No.1 (Secondary)
	3,7,6 Row No.2 (Primary)
	4,7,12 Row No.2 (Secondary)
	6 Row No.3 (Primary)
	1,4,10,11,12 Row No.3 (Secondary)

1 03 06 It was proposed to rectify the flange leak of Row No.6 tube No.39. Attended, found leakage at big tail of the following :

<u>Row No.</u>	<u>Tube Nos.</u>
2	2,5,6,7,9
3	2,3,7,8,
6	11

1 04 01 Cleaning of coolers :

Following coolers were cleaned mechanically.

01	Surface condenser	101 - JC
02	Refrigerant condenser	127 -C A/B
03	Syn Gas compressor after cooler	124 - C

Ammonia: Mechanical

Code No.	Description	
1 04 01 04	Syn Gas compressor Inter stage cooler	116 - C
05	Methanator Effluent Cooler	115 - C
06	MEA Solution Centres	108 - C _s
07	Refrigerant compressor	128 - JC
08	Lub. Oil cooler of	101 - J 105 - J 103 - J
09	Air compressor Inter- stage cooler	129 - JC, 130 - JC
10	Air compressor Inter- stage cooler	131 - JC
11	CO ₂ Stripper condenser	110 - CA/ CB
12	Inter and After conden- ser	101 - J
13	Refrigerant compressor Inter cooler	128 - C
14	Gland condenser	101 - JC
15	L.O. cooler of ID Fan	103 - JC

Following heat exchangers need
tube bundle full out for cleaning :

1. Syn. Gas compressor
Inter stage coolers 116 - C
2. Methanator Effluent 115 - C
Cooler
3. Air compressor inter-
stage cooler 131 - JC

Ammonia: Mechanical

Code No.

Description

1 04 01
(Contd)

Following heat exchangers need removed from tube bundle for cleaning.

1. Syn. Gas compressor
after cooler 124 - C

127-C_s Refrigerant condensers were hydro^s tested to pressure of 12 Kg/Cm².
Found Okay.

1 04 02

Feed Preheat Exchanger - 150 - C.

Leakage was reported.

Tubes were expanded

1 05 01

Primary Waste Heat -
Exchanger - - 101 - CA/CB

Leakage from gas side flange was reported for both boilers

In order to replace gasket on the gas side flange, it was tried to take out the tube bundle of boiler 101 - CB. It could be lifted to about 100 mm; it got stuck up although a force of about 6-70 ton was applied. Weight of tube bundle : 22 tons.

Assuming this had been merely stuck up, we tried to lift up other boiler tube bundle - 101-CA. This also could not be lifted although a force of 60 tonnes was exerted. Next a joint force of

Ammonia : Mechanical

Code No.

Description

1 05 01
(Contd)

4 screw jacks of 50 tonnes capacity each with a total force of 200 tonnes could lift up the tube bundle only 15 mm. It was felt risky to apply more force.

The project for changing of gasket to stop gas leak was abandoned and tube bundles were fitted back by applying, sealing, compound in old gaskets.

Arrangement was made to vent the leaking gas of 101 - CA/CB gas side main joint.

1 06 01

Relief valves :

It was proposed to repair/replace following relief valves :

RV 105 D Sentinel 103 - JAT
RV 102 C RV 107F-2 Nos.
RV 106 F

The following relief valves were repaired & tested.

105 D

103 JAT

107 F

Ammonia : Mechanical

Code No.	Description												
1 06 01 (Contd.)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Name of RV</th> <th style="text-align: left;">Popping Pr.</th> <th style="text-align: left;">Reset Pr.</th> </tr> </thead> <tbody> <tr> <td>110 F</td> <td>100 PSI</td> <td>90 PSI</td> </tr> <tr> <td>111 F</td> <td>90 PSI</td> <td>80 PSI</td> </tr> <tr> <td>112 F</td> <td>90 PSI</td> <td>80 PSI</td> </tr> </tbody> </table> <p>RV of AG line near gas receiving station was calibrated at 6 Kg/Cm².</p>	Name of RV	Popping Pr.	Reset Pr.	110 F	100 PSI	90 PSI	111 F	90 PSI	80 PSI	112 F	90 PSI	80 PSI
Name of RV	Popping Pr.	Reset Pr.											
110 F	100 PSI	90 PSI											
111 F	90 PSI	80 PSI											
112 F	90 PSI	80 PSI											
1 06 02	CO ₂ Stripper Reflux Drum - 103 F scaffolding was done. Welded the corroded portion of nozzle.												
1 06 03	<u>Start up Heater 102 - E :</u> Cleaned the strainer												
1 06 04	<u>MEA Pump Turbine - 107 JAT :</u> It was proposed to Repair/Replace discharge valve & its check valve. Replaced Isolation valve of steam trap. Boxed up oil cooler after cleaning.												
1 06 05	<u>Quench Pump - 106 J</u> Checked the alignment of pump with motor												
1 07 01	<u>Steam leaks and Gas leaks :</u> It was proposed to change the gasket of 103 C & those as per list furnished by the production department Found gasket seat damaged. Filled it up by metal spray, provided new gasket. Attended steam leaks												

Ammonia : Mechanical

Code No.	Description
1 08 01	<p><u>Transfer Line - 107 - D :</u></p> <p>It was proposed to inspect/repair plug leak and repair/replace shroud as required. Also radiography of refractory by Inspection group.</p> <p>Plug was removed. Liner was found completely buckled there was a crack upto 50 mm approximately.</p> <p>This was covered. A strip of inconel sheet was inserted in entire circumference and the position was held tight welding SS rod crosswise.</p>
1 09 01	<p><u>CO₂ Stripper condenser - 110-CA/CB</u></p> <p>CO₂ outlet exit line from 110 CA/CB was proposed to be changed.</p> <p>Removed old gaskets and boxed up T connection blind gaskets. Also removed channel cover and boxed up with new gasket</p>
1 12 01	<p><u>CO₂ Stripper - 102 EA/EB</u></p> <p>Welding of gas outlet line was done. One plate of 102-EA was found damaged. It was welded. Removed nipple from chemical injections system and new line was provided ½ metre length.</p> <p>The pipe lines alongwith both bends on CO₂ outlet line were changed</p>

Ammonia : Mechanical

Code No

Description

1 16 01

Secondary Reformer - 103 - D

SS liner was buckled. Repaired it.
Air burners were inspected and
boxed up.

Code No.Description

1 20 01

Auxiliary Boilers Burner :

It was proposed to install Naptha/Gas combination type 5 Nos Burners in place of the existing burners.

All new combination type burners were installed after removing the earlier burners. The job was done by contractor-Simon Carves India Ltd. In addition this job involved refixing of damaged refractory, piping hook up etc. This was done.

While working on the combination type burners, it was noticed that the refractory beyond the top burner towards the ceiling, had developed a crack. Nearly half the cracked portion of refractory was changed by SCIL, the remaining damaged refractory portion was left as such because it was not quite serious and also time was not sufficient

For burner No.4 fan was replaced.

Cleaned Naptha Straines, flushed lube oil of all burners and charged fresh oil

1 20 02

Instal Silencer SP-73 :

It was proposed to remove the existing silencer and install new Silencer whose weight is 5.5 Tonnes while the earlier silencer weight was 2.450 tonnes.

Code No.	Description
1 20 02 (contd)	The job involved : a) Preparation for approach b) Derrick arrangement c) Dismantling and removal of silencer (existing) d) Installation of new silencer. e) Drain piping.

The existing silencer was resting on a spring support i.e the weight of existing silencer was taken by spring support. In the case of new of silencer, there were two(2) alternatives, One alternative was to rest the new silencer on the existing spring and 2nd alternative was the existing support should be removed and the new silencer should rest directly on structural support and expansion of the pipe should be taken by providing expansion Bellow immediately below the vent silencer or an expansion loop at convenient location in the drain pipe. While on the job, it was decided not to rest the new silencer on spring support as spring was not able to take load of new silencer and thermal expansion. The spring assembly was also taken for testing/ modification at Multi Electrical Industries Pvt. Ltd., Baroda. But it was not possible.

The new silencer was finally decided to be installed on structural support with provision of expansion loop. This arrangement was also got confirmed by Kellogg U.S.A.

Ammonia Mechanical

Code No.	Description
1 20 02 (contd)	For draining condensate from silencer SP-73 a vessel 600 NBx10 THK x 800 mm long was provided at ground floor to maintain vapour seal.

1 20 03 Modifications :

The following modifications were proposed during the shutdown.

- 01 8" control valve on AG line
- 02 Condensate pump hook up 112-JB
- 03 25 NB HIVC 178 in HG 02
- 04 100 NB orifice flange in steam line
- 05 Desuperheater hook up
- 06 FRC-2 bypass line

Of the above proposed jobs the following were completed :

- 01 8" control valve on AG line
- 02 Condensate pump hook up 112-JB
- 03 Desuperheater hook up
- 04 FRC-2 bypass line.

The following jobs were not done :

- 01 25 NB HIVC 178 in HG 02
- 02 100 NB orifice flange in steam line

ANNUAL TURNAROUND - 1981

AMMONIA PLANT

INSPECTION

<u>Code No.</u>	<u>Description</u>
1 16 01	<u>Primary Reformer 101-B</u>
01	<u>Catalyst and Riser Tubes</u>
i)	<u>D.P. Test</u> <p>All butt welds were visually examined. In random fashion one third of welds were examined by D.P. Test. Some of the welds having surface imperfections were also checked by D.P. Test. A crack was observed in the butt weld of 3rd tube of the 7th outlet manifold. This butt weld is located between weldolet and the catalyst tube. The crack was fully removed by grinding. The bevelled faces were examined by D.P. Test. The welding was done by TIG process, with Inconel 82 filler wire. The root pass was checked by D.P. test. The second and final pass were also examined by D.P. test. Subsequently the weld was radiographed. No defects were observed.</p>
ii)	<u>Creep Test</u> <p>Creep measurement were carried out at two places on all the tubes. The creep percentage is within permissible limits.</p>
iii)	<u>Ferrite Measurement</u> <p>The ferrite content of the material was measured at two locations on each tube. The ferrite percentage varies between 0.15 to 0.25</p>

Code No.	Description
02	<u>Outlet Manifold</u>
i)	<p>It had become evident that outlet manifold were in bad condition and immediate replacement was the need of the hour. The manifolds had exceeded creep based retiring limits at many places.</p> <p>The job was planned for execution during the annual turnaround. IFFCO with its meagre manpower resources could not have handled this gigantic job at a quick rate and hence job was entrusted to outside agency (M/s. Simon Carve (India) Ltd.)</p>
ii)	<u>Pre-Installation Inspection</u>
a)	<p>It is essential to record initial or base parameters of the material prior to installation. The future service behaviour is gauged with respect to it. Thus outside diameter and thickness measurement were carried out on the outlet manifold lengths at selected locations.</p>
a)	<u>End Plugs</u>
	<p>The required number of end plugs were not available at the site. All out efforts were made to expedite material delivery schedule but unfortunately vendor could not deliver it in time. As a last resort end plugs were fabricated in our workshop. They were examined by D.P. test after fabrication.</p>
iii)	<u>Inspection during Installation</u>
	<p>The outlet manifolds earmarked for replacement were based on the extrapolated creep data. To ensure that extrapolated creep data agrees favourably with actual creep measurements at various places, another set</p>

Code No.	Description
----------	-------------

of creep readings were taken on outlet manifolds, prior to cutting and removal of damaged lengths.

iv) Butt Welds

The cut faces of outlet manifold were examined by D.P. test. Inspection was carried out in following sequence during the welding of Butt joint.

- a. Profile of weld end preparations was checked by template.
- b. Alignment of Headers and root gap of welds was checked.
- c. Root run was examined by D.P. test subsequently it was radiographed to ascertain the quality of Penetration.
- d. The interpass temperature was maintained around 150°C. Surprise temperature checks were carried out by thermalstiks
- e. The welds were examined by D.P. test after completion of final welding, subsequently the welds were radiographed.

In all 16 welds were examined. In some of the weld porosity and lack of fusion was observed. These joints were repaired and re-radiographed.

v) Fillet Welds

The weldolets grinding and checking was continued until desired profile was arrived at. These weldolets were examined by D.P. test to ascertain that they are free from defects like cracks etc.

The fillet weld root run was examined by D.P. test. The inter pass temperature was maintained round 150°C. The

Ammonia-Inspection

Code No.	Description
	welds were again examined by D.P. test after completion of welding.
	In all 181 fillet welds were examined. No defect was observed.

1 16 02

Transfer line 107-D

There is a increase in the magnitude of the buckling phenomenon of the S.S.liner. It has deformed to such a extent, that it is practically impossible to crawl inside and inspect the shroud.

A visual inspection with the help of torch was carried out. We should initiate action to replace it in the forth coming turnaround.

1 16 03

Gas Inlet line of 101-CA-CB

Cracks were observed on the brickdome of the Secondary Reformer (103-D). The S.S.sleeve near the brickdome has buckled at several places. The gas distributor liner has also buckled at several places. The circumferential weld joints have cracked and opened out.

Consequently gas will have a tendency to impinge on the refractory, it may ultimately cause erosion. Attempts were made to weld the joints with Inconel filler wire. These liners need replacement very badly.

Code No.	Description
1 16 04	<p><u>High Temperature shift converter HTS</u></p> <p>The shell in general has uneven surface, it could be the original condition of the plates out of which shell was rolled.</p> <p>Following are other observations :</p> <ul style="list-style-type: none">i) Steam inlet nozzle flange, 2 No. of bolts were missing and others have become loose. In the other flange of the nozzle 4 bolts are missing. The gasket has got damaged.ii) In thermocouple screen 2 No of bolts are missing.iii) Some pittings were observed on the shell at approximately 4 ft from the bottom dish head circumferential weld.iv) On the north west side, at about 3 ft from the bottom, there is indications of electrode touch on the shell. A sort of crater is formed. The screens are in good condition.
1 16 05	<p><u>Low Temperature shift converter LTS</u></p> <p>The shell is in good condition. Following are other observations.</p> <ul style="list-style-type: none">i) The gasket of the first flange of steam inlet line has worn out. It is to be replaced.ii) The mesh surrounding the dump out pipe is torn out. Needs patch work.iii) The screens are in good condition.

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Ammonia Plant

Instrumentation

Code No.	Description
1 18 01	<u>Control Room Jobs :</u>
01	The following electronic instruments (Temperature Analyser, speed) were overhauled, cleaned, inspected, lubricated & calibrated. i) TR-5, 6, 7, 13, 14, 15, TI-1 ii) AR-1, 2 and ARC - 3 iii) SR-1
02	The following Taylor recording receivers, indicating receivers, and transmitters were overhauled, cleaned, lubricated, calibrated and put back in service. FRRCa-1, . PRCa -2, 4, 9, 12, 18, 19, 23, 25, FRCa -2, 3, 5, 18 PICA -5, 13, 28 FICa- 13, 15, 16, 17 PRA-8, 35, 62 FRa-4, 33, 35, 40 PDRA-26, 27, 34, 35, 36, 37 TRCa-10, 11, 12 LRa-1, 4, 70, 88 PDRCa - 101 Taylor pneumatic Transcope Controller were overhauled, cleaned, synchronized and put back to service.

Ammonia : Instrumentation

Code No.	Description
1 18 01 (Contd)	FRRCa-1 FRCa-2, 3, 5, 18 FICa-13, 15, 16, 17 PRCa-2, 4, 9, 12, 18, 19, 23, 25 PICa-5, 13, 28 TRCa-10, 11, 12 PDRCa-101
04	Following receiver gauges were cleaned, inspected and their calibration was checked. PIa-62, 80, 82, 83, 84, 85, 125, 150 FIA-19, 62, 63, 64, 65, 95 LIA-76, 80, 81, 84, 85, 86, 82 PDIa-52, 55, 57
05	The following Taylor electronic pneumatic transducers were inspected, cleaned and calibrated TRCa-10, 11, 12
06	The following switches were inspected, overhauled and their settings and performance were checked. FA-81, 82, 83, 84, 85, 86, 87, 88, 89 PA-60, 70, 101, 68, 107, 151 LA-102 (H), 102 (L), 105, 112 (L & H), 113, 114, 126, 129, 142, 153 TA-76, 77
07	Main air header filter regulator and emergency air filter regulators were overhauled.
08	Control panel and C/Panel instruments were cleaned.
09	The following trips and interlocks were checked. FA-81, 82, 84, 89 LA-104, 129, 141 PS-81 Tack-Pack & V-18

Ammonia : Instrumentation

Code No.	Description
1 18 01 (Contd)	<u>Field Jobs</u> :
10	The following field mounted controllers were overhauled, calibrated, synchronised and put back to service. PIC -7, 8, 10, 14, 15, 16, 17, 20, 24, 26, 27, 44 FIC -7, 8, 9, 10, 11, 12, 14, 19, 102 THIC-13, 60 103-J S.O. level controller for LP & HP case
11	The following flow transmitters, differential pressure transmitters were checked and calibrated FRCa-1 FRCa-2, 3, 5 FRa-4, 6 FIC-7, 8, 9, 10, 11, 12, 13, 102, 14 FICa-15, 16, 17, 18, 19 FI-92, 46, 49, 50, 51, FR-95 FIa-62, 63, 64, 65, 98 PDRa-26, 34, 35, 36, 37, 27 PDIA-55 PDI-53, 54, PRa-4 & PDRCa-101
12	The following pressure transmitters were checked and calibrated. PRCa-2, 4, 5, 8, 12, 16, 18 PICa-28, PRa-35 PIA-62, 80, 81, 82, 83, 84
13	The following direct actuating level switches were cleaned, lubricated their contacts performance were checked

Ammonia : Instrumentation

Code No.	Description
1 18 01 (Contd)	LA - 101, 103, 104, 106, 107, 108, 110, 115, 117, 121, 122, 123, 127, 128, 139, 140, 141, 143 LS - 109, 111, 116, 118, 120 PA - 65, 69, 71, 72, 75, 80, 96, 97, 93, 94, PS - 81, 115

14 The following Leveltrol units were checked for normal response.

BC - 2, 3, 5, 7, 8, 10, 12, 13, 14,
15, 16, 18, 19, 20, 21, 23, 25, 26,
27

LRa-70

15 The following control valves were inspected, their stroke was checked, gland packed and damaged parts were replaced.

FRRCa - 1,
FRCa- 2, 3, 18
FIC - 7, 8, 9, 10, 11, 12, 14, 13,
15, 102
TRCa-10, 11, 12,
THIC-60
ARCa-3
MICa-11, 12, 13, 14, 15, 16, 22
PICa-5
PRCa-2, 4, 25, 13A & B, 18, 33
PIC-8, 10, 27, 14, 16, 20, 24

16 Air compressor - 101 -J

All lube oil pressure switches were overhauled and inspected. Their settings were checked. These switches are :-

PA - 76 Low lube oil pressure alarm
PS - 77 Low lube oil A.O.P. Start
PS - 78 Low lube oil S/D
PS- 103 Oil pump discharge low pressure A.O.P start up

Ammonia : Instrumentation

Code No.	Description
1 18 01 (Contd)	17 <u>Synthesis Gas Compressor 103 - J</u> The following alarm, trip switches were overhauled and their setting were checked. PS-104 Low pump discharge A.O.P. Start LA-131 Low level alarm LS-132 Low level A.O.P. start LA-133 Low level alarm LA-135 Low level alarm LA-137 Low level S/D LA-138 High level alarm PA-82 Low lube oil pressure alarm PS-83 Low lube A.O.P. start PS-84 Low lube S/D PS-92 Low Governor oil pressure S/D
	18 <u>Refrigeration compressor - 105 - J</u> All lube oil pressure switches and differential pressure switches were inspected and overhauled. PDA-61 LP Case d/p low alarm PDS-62 LP Case A.O.P. start PDS-63 LP Case S/D. PDA-64 HP Case Low alarm PDS-65 HP Case A.O.P. start PDS-66 HP Case S/D. PA-86 Lube oil low pressure alarm PS-87 Lube oil A.O.P. start PS-88 Lube S/D PS-87A Low seal oil pressure A.O.P.
	19 Old Reliance Vibration Monitoring system was replaced by 7200 series Bently Nevada Vibration Monitoring system.
	20 Complete control system for Coppus burner for mixed fuel firing has been installed. Necessary electrical circuit connection, power supply connections and panel mounting has also been successfully hooked up departmentally.

Ammonia : Instrumentation

Code No.	Description
1 18 01 (Contd)	21 38 Kg/cm ² steam to air coil control valve has been installed with Manual Loader.
	22 One Remote Manual Loader has been provided in the control room to control 3.5. kg/cm ² g steam flow to offsite plant
	23 Control valves on N G Vent line (PRC-1) and on steam line to the MURRAY turbine of 107-JA pump were provided.
	24 Control system for desuperheater system in 38 kg/cm ² g steam header has been installed with Remote temperature controller in the control room. Pressure and temperature control system for 38 kg/cm ² g steam header to auxilliary boiler has been provided in the field.
	25 PGR Ball valves KV-120-1, 2, 3, 4, 5, 6, 7, 8 seats were replaced by stainless steel (as against carbon steel) seats with glass loaded teflon sealing material.
	26 In PGR Refrigeration compressor RX 1, one intercooler bypass switch is provided to bypass high level trip of the compressor during start up
	27 Control system for the blanketing gas pressure control in NH ₃ water tank in PGR plant was installed and checked. In same tank high level and low level switches were provided for alarm.

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UREA PLANT

MECHANICAL

Code No.	Description
2 02 01	<u>CO₂ Compressor (Reciprocating)</u> <u>K 1101 - 2</u>
01	It was proposed to replace the 1st stage gas packings, piston rod etc. because of gas leakage through packings. Also low speed coupling was to be modified for air circulation and heat dissipation. 1st stage suction vessel was proposed to be repaired at site because of corroded weld joints & reduced wall thickness at several points.
02	Overhauled the 1st stage of compressor. Replaced piston, piston rod, piston sleeve, lockwasher, piston rings, bearer pads, gas & wiper packings. Drilled holes on the circumferential surface of the coupling pads cavity as recommended by Peter Brotherhood. Replaced all the 32 Nos. of coupling pads (16 nos. each of 60 & 45 shore hardness) With new piston, less value of clearances between the piston and cylinder was observed, which resulted in knocking sound in hot condition of the cylinder and piston where the compressor was kept running on trial. An additional gasket of 1.4 mm thickness was put between front dome & middle barrel of 1st stage cylinder to maintain the old clearances parameters

Code No.	Description
2 02 01 (Contd)	observed before overhauling. The knocking sound could be eliminated thereafter.
	<p>First stage suction vessel was, removed for repair of weld joints & patch works at reduced wall thickness zones. On grinding the long seam weld for repair work, long cracks of approximately 1/4" to 1 1/2" length were observed across the weld joint in the parent metal. After thorough inspection of the vessel shell weld, cracks were found at various places near the weld joints and decided to replace the shell itself using the same dished ends. But later on dished ends and internals were also found corroded and also were found with microfissurers during ultrasonic inspection. Therefore, it was decided to replace the dished ends also alongwith internals. The vessel was tested hydro-statically for leakage and outlet nozzle was observed leaking Hence, it was decided to get a completely new vessel fabricated with S.S. 304 L as the grade 321 was not available. The vessel was inspected at different stages of fabrication by our Inspection Department. Spot radiography of seam welds was also ordered to be carried out by the party. The vessel was tested at specified pressure mentioned in the drawing at party's workshop. Finally the vessel was put in position and foundation was adjusted in height to take care of little variations of fabrication.</p> <p>A gap of approximately 18 mm had been observed between the 1st stage suction vessel outlet flange and flange of 1st stage suction line to</p>

Code No.	Description
2 02 01 (Contd)	<p>cylinder. A spacer ring of SS 316 alongwith metallic sheet gasket on both the serrated faces ends were provided for proper matching. Concrete supports were repaired in 2nd stage discharge line before and after the cooler (H 1122)</p> <p>Also a semi circular Sch.10 pipe line loop approximately 6.00 meters long connecting the gas outlet flange of 2nd Stage Separator (V - 1112) with the gas inlet line to 1st stage suction vessel was changed, because of pin holes and cracks found in the parent metal near weld joints.</p>

Spares Used :

1. Piston
2. Piston Rings
3. Bearer Pads
4. Piston Sleeve
5. Piston Rod
6. Piston Lock Washer
7. Gas & Wiper packings
8. Spacer Ring
9. Gasket of 7.4 mm thickness
10. Coupling pads 32 Nos.
(40 to 60 Shore hardness -
each 16 Nos.)

As per the recommendation of Peter brotherhood, for the first time pads of 40 shore hardness were put in place of 45 Shore.

All readings are in history book.

Code No.	Description
2 02 01 (Contd)	<p><u>David Brown Gear Box :</u></p> <p>The gasket of gear box casing mating flange was changed to stop the leakage of lub oil through the joint gap.</p>
2 02 02	<p><u>Siemens Turbine for CO₂ compressor</u> <u>Q 1101-2</u></p> <p>Checked front, rear & thrust bearing clearances. Attended steam chest valve leakage and changed Gland follower, Bush, Gland Packing & Pin. Provided pressure gauge tapping point in bearing oil inlet circuit.</p> <p>Repaired the guard to stop oil leakage near high speed coupling.</p>
2 02 03	<p><u>CO₂ Centrifugal Compressor</u> <u>K 1101-1</u></p> <p>Repairing & patch work in 14" Sch. 10 S.S. 304 L line to 2nd stage suction (i.e. H.P. case suction line) was done at 14 nos. of weld joints after seperator (V IIII). where ever required.</p> <p>The patch work was done by putting 14" size S.S. 304 L semi circular rings out from pipe on the weld joints , and did the fillet weld on both edges of the ring.</p>
2 02 04	<p><u>Pignone Turbine for CO₂ centrifugal</u> <u>compressor Q 1101-1</u></p> <p>Checked the Journal & Thrust bearing clearances. Removed the top casing & inspected the rotor, found sealing on rotor. Cleaning of rotor & top casing done by sand blasting.</p>

Code No.	Description
2 02 04 (Contd)	<p>Replaced the scored 60 ata nozzle control valve cone's pair, and repaired the damaged seat in the body. Overhauled the emergency control valve. Overhauled the 14" size steam check valve in 4 ata line.</p> <p>Repaired the leaking gauge glass of oil circuit. Run the turbine, checked the over speed trip mechanism. Checked overspeed trip mechanism governor set for tripping of Turbine at 7280 R.P.M.</p>
2 02 05	<p><u>Anti Corrosion Air Blower K 1102-B</u></p> <p>A complete impeller/rotor unit was assembled and balanced dynamically. Thereafter the blower was assembled with the balanced set of rotor assembly using new bearings, carbon seal rings, and started the blower with new set of V Belts changed.</p>
2 02 06	<p><u>Carbamate Pump Turbine Q 1201-A</u></p> <p>Checked the cold alignment, measured the clearances & inspected the bearings. Also checked the hot alignment and recorded all the readings.</p>
2 02 07	<p><u>Carbamate Pump Turbine Q 1201-B</u></p> <p>Overhauled the turbine. Changed both outer & inner end bearings. Clearances before & after overhauling was measured & recorded.</p> <p>Overspeed tripping done & set at 4600 R.P.M. Hot and cold alignment checked between Gear Box & Turbine.</p> <p><u>Gear Box</u></p> <p>Both the bearings of high speed pinion inspected, clearances measured and finally decided to</p>

Code No.	Description
2 02 07 (Contd)	replace because of increased clearance by new pair. The clearances with new bearings also measured. All the readings recorded.
2 02 08	<u>Prilling Equipment M 1401</u> The assembly was hard to take rotation. Each and every points were cleaned & greasing done.
2 02 09	<u>Prill Tower Conveyor Belt M 1403</u> Changed the tail end pulley's damaged bearings. Also changed the skirt & replaced the damaged rollers.
<u>2 04 02</u>	<u>Vent Condenser H 1502</u> Opened the end covers, cleaned the tubes & boxed-up.
2 04 03	<u>Condensate Tank T 1501</u> Opened the manhole cover, inspected & boxed up.
2 04 04	<u>CO₂ Spray Cooler H 1104</u> Opened the manhole cover, inspected & boxed up.
2 04 05	<u>Flash Tank Separator Scrubber V 1421</u> Opened the manhole cover, Inspected and boxed up.
2 04 06	<u>Flash Tank Separator V 1406</u> Opened the tank, inspected & boxed up
2 04 07	<u>1st Stage evaporator H 1422</u> Opened the evaporator, inspected & boxed-up

Urea : Mechanical

Code No.	Description
2 04 08	<u>Circulation System I Cooler H 1206</u> Opened the end covers, cleaned & boxed up.
2 04 09	<u>Desorber Heat Exchangers H 1301</u> Opened the end covers, deaned, inspected & boxed up.
2 04 10	<u>Ammonia Filter :</u> Inspected & repaired the Ammonia filter
2 04 11	<u>Urea Solution Filter :</u> Replaced the filter cloth.
2 04 12	<u>Recirculation heater H 1204</u> Opened the manhole & inspected. Cleaned the tubes & boxed up.
2 04 13	<u>Desorber Column V 1301</u> Opened the manholes. Removed one set of bubble cap tray completely to make drawing. The above drawing is required for the fabrication of sieve trays, which are to be used in place of bubble cap trays recommended by STAC in Desorber modification project.
2 04 14	<u>K 1101-2 2nd stage inter cooler</u> <u>H 1122</u> Opened the end covers, cleaned, inspected & boxed up
2 05 01	<u>4 ata Steam Drum V 1501</u> Inspected the steam drum. Removed Demisters, cleaned & fitted back. All the cover plates

Code No.	Description
2 05 01 (Contd)	of cyclone seperators were removed from 8 compartments and were fitted back with new bolts. Gauge glasses were attended for leakage. Hydrottest of the steam drum was done at 11.5 Kg/Cm ² for boiler inspection.
2 06 01	<u>Valves :</u> 3 Nos. of Ammonia system suction & Discharge pipe line valves were reconditioned and fitted back in position after hydrottest for leakage. All sizes (from 1" to 4") B.E.L. high pressure line valves seats were repaired by using cutters. Broken or damaged spindles were replaced. Blue impression check done before assembling. Also the broken spindles of Japanese high pressure valves were replaced. Gates of isolation valves for steam turbines Q 1102 & Q 1201 were removed, lapped & fitted back. Cleaning and Greasing of I.D. fans done. Belts also changed where ever required.
2 06 02	<u>Line repairs :</u> All the outlet points of ammonia suction line Relief valves connected to a common S.S. 304 3" sch.,10 line which was finally connected to vent stack. Two 6" sch. 40 & two 8" sch. 80 90°elbows were replaced from steam line because of eroded internal surface & reduced wall thickness.

Code No.	Description
2 13 01	<p><u>Cross Conveyor Belt M 1419</u></p> <p>Changed the damaged belt. The joint was retained by vulcanising. Changed tail end pulley bearings. Replaced the gear box unit because of leaking oil seals. Changed the worn out coupling bolts. Replaced the damaged rollers.</p> <p>Belt - Length - 18 M. Width - 800 M M Bearings -2" size (Plumber block)</p>
2 16 01	<p><u>Autoclave V 1201</u></p> <p>Removed one segment of each tray (Total 10 Nos.) for inspection of the vessel. The ammonia inlet nozzle was inspected. Found a crack in the fixed liner of the nozzle near weld joint. Cut the nozzle by hacksaw from line & removed by grinding the weld joints. Repairing was done as it was done earlier during similiar shutdown, X ray and ferrite check of weld joints was done after completion of job and was found O.K. Trays holding lugs, supports & liner of each compartment were inspected by Stamicarbon engineers. At four places in four different compartments minor weld repair work noticed and repaired them according to the instructions of Stamicarbon engineers. Few of the tray holding bolts noticed with corroded weld joints and hence replaced by the spare bolts available in store.</p>
2 16 02	<p><u>CO₂ Stripper H 1201</u></p> <p>Opened top & bottom covers. Took out the false tube sheet & ferrules. Inspection of vessel, tubes, ferrules & false tube sheet</p>

Code No.	Description
2 16 02 (Contd)	<p>done by Stamicarbon engineers.</p> <p>Fitted the ferrules back in positions after cleaning & Δ P checking with indigenous PTFE sleeves. Boxed up top & bottom covers with aluminium gasket</p>
2 16 03	<p><u>H.P. Condenser H 1202</u></p> <p>Removed the top & bottom covers, took out the casing rings, basket & bottom tray. Inspection of tubes & welding done by Stamicarbon engineers. Minor weld repairs done on the top end tube sheet of the vessel at two points according to the instructions of Stamicarbon engineers.</p> <p>Few $\frac{1}{2}$" UNC bolts got broken into the holes of basket supporting ring. Broken bolts were removed by drilling & thereafter the basket was fitted with new $\frac{1}{2}$" UNC bolts of material SS 316 L in position</p> <p>Few of the tray holding bolts noticed with corroded weld joints and therefore replaced by new available in store.</p>
2 16 04	<p><u>Rectifying column V 1202 :</u></p> <p>Opened the manholes & inspected, Inspection done by Stamicarbon engineers too. Thereafter boxed-up. Insulation was repaired near manhole.</p>
2 16 05	<p><u>23 ata Steam Saturator V 1502</u></p> <p>Opened the manholes. Crack was found all along the periphery of the 12" size inlet nozzle weld joint with the vessel. Removed the metal upto the depth of reinforcement pad surface (approximately 34 mm) for approximately 2" width on circular weld position</p>

Code No.	Description
2 16 05 (Contd)	Welding was done after preheating and thereafter stress relieving was carried out. Changed 4" size steam line from 23 ata saturator to 9 ata saturator, as erosion was noticed in line & elbows.
2 16 06	<u>2nd stage evaporator separator H 1424 :</u> Opened the cover, inspected cleaned & boxed-up.
2 16 07	<u>K 1101-1 After Cooler Separator V 1112 :</u> Opened the top cover. Replaced the corroded demister pad & boxed-up. Also attended the drain traps.
2 16 08	<u>Ammonia Water Tank T 1301 :</u> Opened the manholes, cleaned, inspected & boxed-up.
2 16 09	<u>Urea Solution Tank T 1401 :</u> Opened the manholes, cleaned, inspected & boxed up.
2 20 01	<u>CO₂ Spray Cooler Pump P 1106-A :</u> Location of LCV 1101 8" size control valve changed for easy of maintenance. A platform was made around it.

Urea : Mechanical

Code No	Description
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2 20 (2

Following jobs were proposed

- 01 250 NB Steam tapping (60 ata line)
M/s BHEL
- 02 40 NB Steam tapping for BFW
Boiler (40 ata) M/s Ario Bros.
- 03 200 NB Superheated steam tapping
(4 ata line) M/s Ario Bros.
- 04 200 NB Saturated steam tapping
(4 ata line) M/s Ario Bros.
- 05 80 NB condensate line tapping-
M/s Ario Bros.
- 06 100 NB condensate line tapping-
M/s Ario Bros.

All the above jobs were completed.

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Urea Plant

Inspection

<u>Code No.</u>	<u>Description</u>
2 16 01	<p>The following vessels were opened and offered for inspection. Inspection and test result including observation are mentioned below.</p> <p><u>Urea Solution Tank T-1401</u></p> <ul style="list-style-type: none">i) Bulging of the two central plates in the flat bottom of the tank was observed.ii) In the outlet nozzle (bottom south side) a lot of rashing rings had accumulated.iii) Lower one third portion of the shell had slight brownish black colouration while the top two third portion of the shell assumed light brownish colouration.iv) In general, the tank was satisfactory and no trace of distinctive corrosion for erosion was observed.v) Ultrasonic thickness test of the shell was carried out. Thickness readings are noted
2 16 02	<p><u>Ammonia Water Tank T-1301</u></p> <ul style="list-style-type: none">i) Bulging of the bracing plates of the tank flat bottom was observed.

Urea - Inspection

Code No.	Description
	ii) Some dirt accumulation in the over-flow chamber was observed which was informed to the operation for cleaning.
	iii) No trace of corrosion or erosion was observed.
	iv) Top portion of the shell including the roof (i.e. gas space) has got shining greyish-white colour especially in weld joints. Lower part of the shell including bottom plates was of dull brownish colouration.
	v) Thickness test of the shell was carried out and the readings are noted.

2 16 03

CO₂ Knockout Drum V-1101

- i) Bottom dished end and shell portion upto demister pad height was painted. The paint coating withstood the aggressive environment of wet carbondioxide satisfactorily.
- ii) Some dirt impregnation was observed in the demister pad. Urea operation people were informed for getting it cleaned.
- iii) No trace of corrosion or erosion was observed in the vessel except some rusting on the demister pad support. Operation people were also asked to get the support painted to prevent further rusting.

Urea-Inspection

Code No.	Description
2 16 04	<u>CO₂ Spray Cooler H-1104</u> <ul style="list-style-type: none">i) The top manhole of the cooler was opened. The shell inside of the top compartment was painted. At some places blisters were observed in paint coating.ii) There was no corrosion or erosion in the shell except the rusting in the areas from where the paint had blistered off.iii) Demister pad in general, was found good.iv) Immersed portion of the shell outside developed thick rusting and pitting.v) Operation people were informed and asked to get the shell cleaned and painted including the top chamber from where paint had blistered off.
2 16 05	<u>Description Column V-1301</u> <p>Both the top and bottom manholes were opened.</p> <ul style="list-style-type: none">i) In bottom compartment one clip for fastening tray was missing and one clip bolt was loose.ii) In the bottom compartment the dish end and shell portion assumed brownish-black colouration.iii) In the top compartment the shell and the dish-end including baffle also assumed brownish-black colouration.iv) On the top sieve-tray non-metallic tripod covers of most of the holes were missing.

Urea-Inspection

Code No.	Description
v)	In both the compartments (top & bottom) no trace of erosion or corrosion was observed.
2 16 06	<u>Four Ata Steam Drum V-1501</u>
i)	A lot of blackish dust accumulation was observed on the shell.
ii)	A large no. of baffle bolts were either loose or broken and some nuts and bolts were missing which were replaced by urea maintenance.
iii)	One pitting of 1.5 mm depth near second baffle from north in west side and the other pitting of 2 mm depth near second baffle from north in the east side row of baffles, which were detected in earlier shut-down 1979 have not increased in dimension in any way.
iv)	No corrosion or erosion was observed in the vessel.
v)	The vessel assumed brownish black colouration.
vi)	Thickness measurement of the shell and dish ends was carried out. The readings are noted
2 16 07	<u>23 Ata Steam Saturator V-1502</u>
i)	In the 'U' bolt support of the inlet header one nut was missing.
ii)	The shell inside was of brownish colouration.

Urea-Inspection

Code No.	Description
2 16 07 (Contd)	<p>iii) No corrosion or erosion was observed in the vessel.</p> <p>iv) Thickness measurement of the vessel was carried out ultrasonically and reading are noted</p> <p>v) A half inch long crack was detected by D.P. test in the inlet pipe fillet weld joint with the dish end from in-side. But while grinding out, the cracked area for repair, it was found that the crack had interally propogated more than half of the circumferencial weld length of the nozzle. (i.e. crack about 22 inch) and a lot of very big slage inclusions also observed.</p> <p>Therefore the full length of this nozzle joint was gauged off and rewelded.</p> <p>1) Before starting the welding the joint faces were d.p. tested several times untill the faces were found defect free.</p> <p>2) The D.P. test was again carried out after final welding and found O.K.</p> <p>3) Stress relieving of the joint was carried out and the hardness after stress relieving was 173 BHN.</p>
2 16 08	<p><u>H.P. Condenser H-1202</u></p> <p>Top flange of the vessel was lifted and the vessel was offered for inspection. The following inspection tests were performed on the vessel.</p>

Urea : Inspection

Code No.	Description
2 16 08 (Contd)	<p>01 <u>Visual</u> :</p> <p>Visual inspection of the top compartment including the basket was done.</p> <p>i) In the basket a few bolts for fitting perforated small tray were broken and some were loose.</p> <p>ii) Some bolts for fitting the basket with main tray were found loose.</p> <p>iii) In the butt weld joint of the top nozzle below the flange some erosion and pitting were observed.</p> <p>02 <u>D.P. test</u> :</p> <p>D.P. test of the gasket seat for shell flange SS liner weld joints, basket weld joints and top nozzle butt joint where erosion and pitting were visually observed, was done.</p> <p><u>Results</u> :</p> <p>No other defect was observed except the weld areas where pitting was found visually.</p> <p>03 As desired by the stami-carbon expert the condenser top tray was removed for examination of the top tube sheet.</p> <p>i) At one place on the tube sheet cladding small crack was observed.</p> <p>ii) At another place deep under cut in the fillet weld joint around a tube with tube sheet cladding was observed. Both the defective spots were ground and a weld layer was deposited in presence of those experts. Dye penetrant test was done on repaired areas.</p>

Code No.	Description
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04	<u>Ferrite test</u>
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Ferrite measurement of the welding of tubes including welding repair portions, stainless steel liner, Liner weld joints, basket welds and also of gasket seats of the flange and shell was carried out.

No where ferrite content was more than 0.10%.

2 16 09

<u>Autoclave V-1201</u>

As before annual turn-around some leakage of gas was observed in the Autoclave ammonia inlet nozzle through the 'Weep-Hole', the Autoclave was opened, cleaned and offered for detection of the leakage and for general shutdown inspection. The following inspection tests were carried out on the vessel.

01	<u>Leakage Dedection</u>
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- i) D.P. test of the ammonia nozzle sleeve weld joints with the additional liner and the later welding with original liner was carried.
- ii) D.P. test of the sleeve-bore of the ammonia inlet nozzle at the heat affected zone was done.

Results

A group of paralell cracks in the sleeve were observed in the 'HAZ' of the liner weld joint with sleeve almost at the same location as crack was found in earlier occasion.

Urea-Inspection

Code No.	Description
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02 Dye-Penetrant test

- i) D.P.test of nozzle bore, sleeve and sleeve welding, liner welding and etc. during and after replacement of the new sleeve was done.
- ii) Dye penetrant examination of all the welding joints in the Autoclave liner including the 'HEMI-ENDS' petals joints was performed.

Results

No service defect was observed.

03 Ferrite test

Ferrite measurement of all the liner plates weld joints in them has been done at random in order to assess corrosion resistance of the liner.

Results

(Ferrite 0.15% max) satisfactory.

04 Thickness Survey

Thickness measurement of all the liner plates has been done at random to find out any reduction in lining thickness of the autoclave due to uniform corrosion or erosion, if any.

Results

The thickness readings are **noted**

05 Miscellaneous check up

At two/three places in tray support and in liner parent plate, some welding

Urea-Inspection

Code No.	Description
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metal was to be deposited as asked by the stamcarbon experts. These spots were tested by dyepenetrant after welding and also the ferrite test was performed.

Results

Results were satisfactory.

06

Visual Inspection

The liner in general was of blackish gray colouration except some areas where it assumed dull-brown colour. But the weld joints had bright greyish-white colour in general.

2 16 10

Steam Condensate Tank T-1501

As the vessel was not opened thickness measurement from outside was carried out ultrasonically. The thickness readings are **noted**

2 16 11

Pipe Lines

Thickness survey of the following pipe lines and branches was carried out as asked by the Supdt.(Urea).

- 01 ST-1211-2"-B4-9 Ata Steam injection line to HP condensor.
- 02 9 Ata steam to C.C.S. II jacket (Modified line)
- 03 ST-1503-12"-B4 - 23 ata steam line to 9 ata drum.
- 04 SC-1513-4"-B4, 9 ata steam drum to let down control valve of 23 ata steam line.

Urea-Inspection

Code No.	Description
05	i) SC-1407-6"-04, H-1422 to T-1501
	ii) SC-1409-4"-B4, H-1424 to T-1501
06	SC-1504-6"-B4, 9 ata condensate line to 4 ata drum.
07	ST-1504-10"-B4, PIC-V-1131 Let down line from 9 ata to 4 ata header
08	ST-1508-2"-B4, 4 ata steam to 2.5 ata letdown.
09	Jacket of PR-1408-3", connected to Urea melt pump
10	SC-1507-3"-B4, P-1505 condensate pump to Tank
11	ST-1123-14"-B4, PIC-V 1129 Down steam
12	SC-1507-3"-B4, condensate return line P-1505 to T-1501
13	i) SC-1509-3"-B4, up stream of C/V
	ii) SC-5151-3"-B4, Discharge of C/V (P-1505 discharge line to off site plant).

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Urea Plant

Instrumentation

Code No.	Description
2 18 01	01 Removed autoclave radio active source after taking counts. Source was put in lead container. This was done to facilitate to work in reactor without radioactive rays in that area.
	02 Removed JBA-3 and welded new junction box. Fixed all cables and provided tag No. plates on all tables.
	03 Removed I/L Kota make TR-1 recorder and cutout was modified to fix Taylor make recorder. After fixing Taylor recorder all thermo-couples and power connection were given and made ready with all respect.
	04 Removed TR-1206 (Autoclave off gas temp.) thermowell for inspection.
	05 Removed LRC-1201 (Stripper level) d/p cell and its impulse lines alongwith purge lines, This was done to facilitate maintenance people to remove bottom flange of Stripper.
	06 Removed LH-1201 (Level high switch for stripper) radio active source and detector unit.
	07 Following control valves were removed from line and completely overhauled calibrated and fixed back. 1) MICV-1101 2) LCV-1101 3) FICV-1102 4) PICV-1128 5) PICV-1129 6) TICV-1201 7) PC-1501 8) PC-1221 9) FICV-1204 10) HICV-1422 11) HICV-1122 12) FICV-1203 13) PRCV-1504 14) LCV-1123B 15) PRCV-1501 16) FRCV-1201

Urea-Instrumentation

Code No.	Description
08)	<p>Following air headers were supported with clamps or welded and trays were provided.</p> <p>1) FRC-1.1 2) HICV-1121 3) LH-1201 detector mounting 4) PI-1145 5) PHA-1201 6) LRC-1201 TX 7) PC-1501 8) TRCV-1422 9) PRC-1201 10) NH₃ receiver pressure gauge tapping 11) Support for 60 ata pressure tx. 12) HICV-1202 13) Steam header for chromatograph was out and route was changed.</p>
09)	FRC-1.1 control loop (Antisurge control) was checked and also calibration was checked.
10)	Calibration and cleaning of all receiver switch were carried out.
11)	<p>Following instruments in control room were removed one by one and cleaned, calibrated and fixed back.</p> <p>a) Indicating controller b) Recording receiver c) Pressure gauges d) E/p. converter e) Servotran temp. indicators f) Temp. recorders.</p>
12)	All vibration probes from both compressors were removed. After completion of maintenance work, they were fixed back and calibration was checked alongwith respective proximeter and channel.
13)	Removed low & high level switch for NH ₃ receiver. Checked and fixed back.
14)	DPI-1208 : D/P cell was removed and tappings were dinded.

Urea-Instrumentation

Code No.	Description
15)	<u>FIC-1204</u> Removed rotameter from line. Float was found in damaged condition and bearing and follower shaft were jammed. As such new meter body along with bearing shaft, float etc. were replaced and rotameter was fixed back.
16)	All field instruments i.e. controllers, pressure transmitters, pressure switches, level transmitters, level trols etc. were calibrated and fixed back.
17)	<u>F.S. 1101</u> NH ₃ flowmeter was opened completely overhauled reassembled and fixed back.
18)	<u>60 ata new pressure Tx</u> 300 series pressure transmitter was fixed on PR-1145 and transmitter was given in line.
19)	<u>LCV-1201</u> Control valve dome was opened. Piston rod 'O' ring was changed as there was leakage thro' dome. Seal tube bottom gasket also replaced
20)	All control valves A/M switch and hand jack mechanism were checked and overhauled.
21)	<u>LR-1201-III</u> (Radio active level measurement) checked complete system alongwith detector pad, source and recorder and calibrated and fixed back.
22)	<u>LH-1201</u> (Stripper level high) Removed detector pad, source from stripper, checked GM tube, pre-amplifier and re-assembled. Checked performance alongwith detector, source and indicator unit and found alright.

Urea-Instrumentation

Code No.	Description
23)	All instruments i.e. temperature recorders, temperature alarm indicators, manual loaders pressure gauges etc. on local compressor panel were removed one by one and fixed back after calibration.
24)	Cleaning and checking of all control valve positioners were carried out.
25)	Overhauling of all air regulators were carried out.
26)	Cleaning and checking of all the annunciators were carried out.
27)	Limit switch for alarm on prill divert valve was fixed.
28)	Battery cleaning and charging was carried out.
29)	All instruments at dry ice plant were checked and calibrated.
30)	Power isolation switch was provided at O2 analyser panel.
31)	<u>LCV-1101</u> : Control valve was removed and its location was shifted on straight line portion for better operation of the control valve.
32)	Carbamate pump & Ammonia pump lube oil switches were overhauled and calibrated.
33)	Main control room panel and compressor panel were cleaned and painted. Also painted some field pneumatic and electrical junction boxes.

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OFFSHORE

MECHANICAL

<u>Code No.</u>	<u>Description</u>
3 02 01	<u>Cooling water pumps - P 4401/A & B,</u> <u>P 4402 & P 4403 :</u> a) Inspection of Impeller b) Inspection of bearings c) Gland repacking
3 02 02	<u>Raw Water Pumps</u> <u>P 4101 A & B</u> a) Checking of impellers condition and their repair b) Checking of bearings. d) Alignment of pump with motor
3 02 03 01	<u>F.D. Fan & Turbine K - 5101/ B and</u> <u>Q 5101 / B</u> a) Inspection of Fan bearings b) Misalignment of fan & Gear box check c) Gear box bearings check d) Turbine bearings check

Offsites : Mechanical

Code No.	Description
3 02 03 (Contd)	e) Replacement of turbine gland packing f) Cooler cleaning
3 05 01 01	<u>Boilers No. 1 & 3 :</u> Cleaning of air & flue gases duct. Offered for inspections and approved by CIB, Gujarat
02	<u>Degenerator - V 5101 :</u> Inspection and cleaning of vessel
03	<u>PIC - 5151 :</u> Modification of 60 ata to 40 ata let down valve line.
3 09 01	<u>Anion - IV :</u> Changed piping
3 10 01	<u>Anion - III :</u> Vessel rubber lining inspection and repair was carried out.
3 16 01	<u>Miscellaneous :</u> Steam and traps leak were attended

Offsites : Mechanical

Code No.	Description
3 02 03 (Contd)	e) Replacement of turbine gland packing f) Cooler cleaning
3 05 01 01	<u>Boilers No. 1 & 2</u> ; Cleaning of air & flue gases duct. Offered for inspections and approved by CIB, Gujarat
02	Deaerator - V - 5101 ; Inspection and cleaning of vessel
03	<u>PIC - 5151</u> ; Modification of 60 ata to 40 ata let down valve line.
3 16 01	<u>Miscellaneous</u> ; Steam and traps leak were attended
3 09 01	<u>Anion - IV</u> ; Changed piping
3 10 01	<u>Anion - III</u> ; Vessel rubber lining inspection and repair was carried out

Offsites: Mechanical

Code No.	Description
3 20 01	Following jobs were proposed
01	150 NB BFW tapping (90 Kg/cm ² g line). M/s BHEL
02	100 NB DM water tapping
03	CWR connections (Boiler Air Compressor)
04	Naphtha Feed Pump turbine piping hook up
05	ARC valve on Naphtha pump discharge

All the above jobs except the following were done.

- 01 Naphtha Feed Pump turbine piping hook up
- 02 ARC valve on Naphtha pump discharge

Offsites : Mechanical

<u>Code No.</u>	<u>Description</u>
3 19 01	<u>Effluent & Chromate Removal Plant :</u> Repair of effluent tank was done.
3 19 02	<u>Boiler No. 1 & 2 :</u> Repair of refractory was done.
3 22 01	<u>Rerubber lining of cation vessel</u> <u>No. III :</u>
01	Removal of headers & laterals .
02	Removal of damaged rubber lining
03	Removal of damaged supports
04	Fixation of New supports & Sodium analyser nozzle
05	Grinding of weld places for rubber lining.
06	Sand blasting
07	Apply solution & adhesives
08	New rubber lining.
09	Steam curing
10	Spark test and repair of damaged parts
11	Lateral and nozzle fixation

Offsites : Mechanical

Code No.	Description
3 22 02	<u>Re-rubber lining of cation vessel No.IV :</u>
01	Removal of headers & laterals
02	Removal of damaged rubber lining
03	Removal of damaged supports
04	Fixation of New supports & Sodium analyser nozzle
05	Grinding of welded places for rubber lining.
06	Sand blasting
07	Apply solution & adhesives
08	New rubber lining
09	Steam curing
10	Spark test and repair of damaged parts
11	Lateral and nozzle fixation
3 22 03	<u>Wood work cooling Tower :</u>
	Repairs of hood and Baffles

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Offsites

Inspection

Code No.	Description
3 16 01	<u>Cation III and Cation IV</u>
01	<u>Spark test</u> Test of the following vessels after rerubber lining and curing was carried out. <u>Results</u> In each of the tanks a few defective spots observed which were repaired and spark tested again and found O.K. Shore-hardness test was done and the lining in general, had hardness between 60 and 70 shore 'A'.
02	Spark testing of 7 Nos of rubberlined headers and 11 Nos pipe pieces with flange including some bends were required to be used in the water treatment plant, was carried out. Three headers were found to have some defects. The supplier was asked to repair those defects. After repair the soundness was checked by offsite maintenance.
3 16 03	<u>Offsite Boilers F-5101 A/B</u>
01	Thickness measurement of the offsite boiler
	i) Water wall tubes
	ii) Superheater tubes
	iii) Water tube outside bends in hand-holes

Offsites-Inspection

Code No.	Description
iv)	Air preheater coils in each of the two boilers has been done.
02	<p>Thickness measurement of the super heater steam lines of both the boilers upto 60 ata steam header.</p> <p>All the thickness readings are recorded.</p>
3 16 03	<p><u>Naphtha Tank T-3101/B</u></p> <p>This is first time in seven years of plant operation the naphtha tank was opened for inspection. The top manhole and two bottom manways of the tank were opened. The tank inside was cleaned and roof top side was cleaned by sand blasting. Then the vessel was offered for inspection. Following are the details of inspection and test carried out on the tank.</p>
01	<p><u>Visual</u></p> <p>The shell inside, flat bottom and roof inside and out side were visually inspected. The observations are as given below.</p> <p>i) There was no localised corrosion or pitting on the shell except the rusting of the shell due to atmospheric contamination.</p> <p>ii) In general, the shell assumed brown colouration.</p> <p>iii) No localised corrosion or pitting was observed on the flat bottom.</p> <p>iv) The bottom plates assumed brownish black colouration</p> <p>v) No localised corrosion or pitting was observed on the inside surface of the floating roof.</p>

Offsites-Inspection

Code No.	Description
	vi) In general, brown colouration was observed on the inside surface of the roof.
	vii) Outside surface (i.e. top side) of the floating roof has severe pitting corrosion specially in the areas, where the rainwater accumulation takes place. The rusting and corrosion at some places have reduced the roof thickness badly.

3 16 04

Thickness test

Thickness measurement of the shell first course, and of the flat bottom have been done. While the thickness survey of the floating roof has been accomplished before and after sand blasting in order to assess the need of any immediate repair. The thickness readings are recorded.

3 16 05 01

D.P. Test

About 20 weld joints after root run in the modification work of steam letdown station under taken by offsite maintenance, was carried out.

02

Radiography

Some of the weld joints were radiographed as percentage radiography out of which two weld joints contains unacceptable defects. Repair of the defective joints could not be done due to lack of time and will be done in the next opportunity.

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Annual Turnaround 1981

Offsites

Instrumentation

Code No.	Description
3 18 01	01 <u>Ignitor System of Boiler No. 1 & 2</u> New SS tubing was done with proper support. New hose pipes were provided of longer length for easy operation and maintenance. In Boiler 1, ignitor high voltage transformer unit is shifted to convenient location for easy maintenance approach.
	02 <u>PIC 5151</u> After fixing a new control valve its tubing work was done. <u>PICT 5151</u> Transmitter was also shifted to convenient location. Its air line routing was also changed. New impulse line tubing for transmitter as well as local PI was done.
	03 <u>Peabody panel</u> All trays were taken out, cleaned and fixed back after checking all the relays on test board.
	04 Calibrated some important PIs.
	05 Feed water pump discharge pressure indicator on main panel. On request of P/P for above, provided a pre-transmitter and its relative tubing for impulse line, air line, and output tubing upto panel wad done.

Offsites-Instrumentation

Code No.	Description
3 18 02	<u>D.M. Plant</u>
01	The bypass rotameter provision was removed because very difficult approach was there and moreover flange was in a such position that rotameter cannot work. A.D.P. transmitter was provided and a local flow indicator is provided and its relative tubing work was done.
02	Acidic water flow measurement for regeneration of cation beds. Bypass Rotameter was removed because of frequent stuck up of float, breakage of rotameter glass tube. It is replaced by providing a D.P. transmitter and local flow indicator.
03	M-1 HCL tank level measurement In addition to existing system, a new capacitance, type level indicator/controller, system is installed.
3 18 03	<u>Cooling tower</u>
01	<u>Chlorination system</u> Departmentally developed ejection pump which is working at present with no problem. Same type stand by ejector pump is fixed.
3 18 04	<u>Chromate Plant</u>
	Chromet outlet pH meter pH electrodes assembly and KCI pat, junction box etc. were shifted to a convenient location. A flashing arrangement for sample point sample line and electrodes was provided.

Offsites-Instrumentation

Code No.	Description
3 18 05	<u>Ammonia Storage Area</u>
01	Loading unloading system of ammonia refrigeration compressor.
02	Completely pneumatic system was removed and new electrical pneumatic system was designed and system was mounted in the panel and a tubing was done for loading unloading. Also shifted all PIS to a convenient location for maintenance.
02	Ammonia recirculation low flow trip switches. Shifted to a convenient location and also provided a local flow indicator.

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Annual Turnaround - 1981

ELECTRICAL

Code No.	Description
3 17 01	<u>66 KV Yard</u> 66 KV Yard structures, breakers, distribution boards are painted. a) Checking of the 66 KV bus for loose connection carried out and found O.K. b) OLTC of SMVA transformer is checked and oil is filtered. c) SMVA transformer oil is filtered. d) 66 KV P. Ts are checked and painted. e) Control & relay panel is checked for loose connections by tightening f) One broken bush on 11 KVPT of IInd incoming is replaced and this P.T. is taken in line. g) 11 KV breakers are checked and replaced the oil. h) All 66 KV insulators are cleaned. i) All 66 KV isolators are checked and greased. j) 66 KV OCB oil test is taken and cleaned. k) 66 KV MOCB operating mechanism is checked tested and greased.
3 17 02	<u>11 KV M.P.S.S.</u>
01	a) A new P.T. on 11 KV sabarnati feeder is mounted and Old P.T was flashed over and removed some two years ago. b) All the breakers have been checked tested and oil is replaced. c) 11 KV Bus bar chamber is cleaned and checked. d) Running hour meters are fixed for 1350 HP and 300 HP motors on 11 KV panels and

Code No.	Description
	for AHP set on MCC-8 to have the record of running hours for preventive maintenance planning.
e)	11 KV breaker panels control wiring is checked, cleaned and tested.
02	Unit transformers oil level, insulation valves are checked and found O.K.
03	Unit transformers Painting is carried out with C.R. Paint
04	MCC s bus coupler panels are checked and replaced the cracked bus bar supporter, and tested for proper operations.
05	11 KV TMG Breaker panel control wiring is checked for inter locking arrangement.
06	One voltage selector switch with Sabarmati and Chatral supply voltage signals is provided in M.P.S.S. for indication & voltage by one volt meter. This is to make sure that we have both supplies available.
07	Two new MCC's are erected in Ammonia Plant in addition to MCC 5. One MCC is a looping MCC and another MCC is a stand by MCC for any emergency on MCC'5. Important Equipments and lighting of the plant are supplied from MCC 5 and stand by MCC. A Provision has been made on looping MCC to select any one of the loop MCC's for Electrical supply to the equipment connected to it.
08	All lighting D.B's are checked, replaced the burnt out connectors, fuse holders and burnt out cables.
09	Conveyor lighting systems are checked, cleaned and replaced the light fittings.
10	AMF set has been checked and loaded upto 800 KW under the guidance of Kirlo.sker Service Engineer. The set was found working normally.
11	All English Electric relays on all MCC's, 11 KV panels, 66 KV control and relay panels have been tested and calibrated.

Electrical

Code No.	Description
3 17 02 (Contd)	12 Section pillar boxes are checked and replaced the burnt EE fuse holder in Township and made fresh connections whichever cables are found burnt.
	13 MCC 2D checking is done.
	14 Transformer oil in marshalling boxes of 13 Nos. unit transformers is changed. All the marshalling boxes are covered with polythene sheet as precaution against water entering
	15 One KWH recorder is fixed for AMF set on its control panel to have the yearly reading electrical energy utilized from the set from time to time.
	16 82 Nos of motors are overhauled during April/May annual turnaround.
	17 All the MCCs had been overhauled during earlier short shutdown of Plants in 1981 and as such these were not taken up during the current Annual Turnaround.