KALOL UNIT

P. & S. Section
Maintenance Deptt.

REPORT

ON

ANNUAL TURNAROUND - 1979

ACTIVITIES

ISSUE No. 2.

INDIAN FARMERS FERTILISER COOPERATIVE LTD.

PS Section
Maintenance Dep
May 7, 1979

Annual Turnaround Scheduling - 1979
Issue No. 2

I N D E X

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Annual Turnaround Scheduling

Issue No. 2

Estimated Labour Requirement

	Category	Qty
1.	Technician mechanical	1500 mandays
2.	Technician electrical	800 mandays
3.	Technician instrument	700 mandays
4.	Welder	300 mandays
5.	Rigger	1000 mandays
6.	Mason	100 manda-ys
7.	Carpenter	70 mandays
8.	Mazdoor	800 mandays

Annual Turnaround Scheduling - 1979

Issue No. 2

Estimated Mobile Equipment Requirement

	Item	QTY
1.	65 Ton crawler type crane	1 No
2.	15 Ton mobile crane	2
3.	2/3 Ton Forklift	7
4.	1/2 Hoist	2
5.	Truck	5
6.	Generator Welding Set	8
7.	Transformer Welding Set	3
8.	Rectifier	1
9.	Diesel generator	1
10.	Mobile compressor 250 cft/hr	1
11.	Centrifuge	3
12.	Guniting machine	1
13.	Dewartering pump	3
14.	Transformer oil filter	1

Sr. No.	Description	Main job No.
1.	Drain valve of LTS outlet by pass valve is passing.	1.03.03
2.	To replace broken burner blocks for primary reformer.	1.01.01
3.	To provide isolation valves and bypass valve for Lube oil filter of I.D. fan	1.01.12/07
4.	Inspect Reformer Tube outlet manifolds, where creep was observed, replace the insulation blocks/Inconel sheets.	1.01.02
5.	Change air burner for 103 D	1.02.01/09
6.	SP-71 isolation valve and control valve not holding.	1.03.02
7.	Inspect the furnace refractory and fill the expansion joints with Kao-wool and repair the damaged refractory.	1.01.03
8.	Inspect the spring support for loose bolts and nuts and repair without changing the spring seating.	1.01.08
9.	Opening & closing of bottom and top covers of Sec. reformer for Cat changing.	1.02.01
10.	Open & close the MH cover grating and screen on HTS converter for replacing the catalyst.	1.03.01
11.	Open and close all reformer tube inlet plugs and end plugs of all inlet manifold heads for catalyst changing.	1.01.04
12.	Transfer line SS lining to be replaced. Inspect refractory lining and repair.	1.01.13
13.	Secondary air resistors of many burners are not operable. To be eased.	1.01.09/01
14.	Naphtha duplex strainer change over valve is stuck up. To be eased.	
15.	Leak test and repair 112-C.	1.08.14/06

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Sr. No.	Description	Main Job No.
16.	L T super heater coil supports to be strengthened.	1.01.14
17.	Furnace floor refractory to be repaired.	1.01.03
18.	Replace refractory in connection section of Auxiliary boiler and reformer (as per the report of inspection during shut down in March, 1979).	1.01.03/05
19.	Pressure test and repair leak in 112-C tube leak.	1.08.04/05

CO2 REMOVAL AND PROCESS CONDENSATE SYSTEM

1.	108-C C.W. outlet butterfly valve is to be repaired.	1.07.03/15
2.	107-JT steam inlet valve is passing.	1.07.03/02
3.	CO2 Absorber rich solution outlet valve and CO2 strippers lean solution outlet valve not holding.	1.07.03/03
4.	Replace 108-C West side Top cooler.	1.04.12
5.	102 EA/B Rich MEA inlet distributor. Inspect and repair.	1.09.03
6.	Replace 110 CA/B outlet pipe withSS line party.	1.07.02/01
7.	106-J discharge line PW-5-2" replace with SS	1.07.02/02
8.	105-CB tube outlet elbow weephole is leaking. Also the tube outlet joint is leaking above the tube sheet. Also check for leaks while shutting down in 105 CS and 11-CS.	1.07.03/01
9.	Repair the in seal leaks on 107-JT.	1.06.07/09

Sr. No.	Description	Main Job No.
10.	Inspect 101-E, 102 EA & B thoroughly and clean.	1.09.02 & 1.09.05
11.	Inspect Test coupons installed last turn around in MEA system and install new ones.	1.07.03/14.
12.	111-J discharge block valves are not holding.	1.04.02/01
13.	105-CB gas outlet flange is leaking (Temporary relief after tightening).	1.04.02/10
14.	109-CB rich MEA inlet exchanger side nozzle box is to be repaired.	1.07.03/09
15.	101-E gas inlet block valve is hard to operate.	1.07.03/10
16.	Provide end flanges on MEA inlet to reboilers 111 CA/B and 105 CA/B - MEA -33-A-16" & MEA 33B-16".	1.07.03/11
17.	Change following CO_2 lines as per insepction report dated 27-1-79; 1. CO-1 A-18" } exit from strippers A & B 2. CO-1 B-18" } 3. CO-3A -18" inlet to 110 CA	1.07.02/03
18.	Connection for amine guard injection to CO_2 stripper exit lines.	
19.	Remove box from 109-C West bottom rich MEA nozzle.	1.07.03/12
20.	Inspect check valve 107-J/JA.	1.07.03/16

Sr.No.	Description	Main Job No.
	SYNTHESIS AND REFRIGERATION SYSTEM	
1.	124-C cooler is to be replaced	1.04.13
2.	Drains of 117-C, 118-C and 119-C are choked to be cleared.	1.07.03/04
3.	V-25 globe valve is passing. To be attended.	1.07.03/05
4.	Inspect 106-F for catalyst dust/oil sludge.	1.09.11
5.	Make arrangemetns for changing synthesis catalyst.	1.05.01
6.	121-J/JA discharge valves are hard to operate.	1.07.03/07
7.	Remove plugs from the weep holes of synthesis converter shell and provide bent nipples pointing downward.	1.07.03/08
	COMPRESSORS (101-J, 105-J, 103-J)	
1.	Oil leak from turbine side seal of seal oil pump of 103-J.	1.06.06/11
2.	105-JT - To remove missing nut of governor nozzle valves from turbine inlet steam admission.	1.06.04/21
3.	103-J lube oil/seal oil pump alignment to be checked as vibration are high.	1.06.06/11
4.	103-JA,T/JBT bearings, alignment and coupling oil leaks on 103-J.	1.06.06/01 & 11
5.	East the trip throttle valves on 101-J and 105-J. These are very hard to operate.	1.06.01/05 & 1.06.04/23
6.	HP case balance line flange leak to be attended on 103-J.	1.06.06/08
7.	103-JA,T power pistons operating full range. It does close fully. But noise while closing.	1.06.06/04

Sr. No.	Description	Main Job No.
8.	Speed governor oil pressure remains low. Check and repair.	1.06.06/06
9.	Provide tapping for manometer on 103-JBT gland condenser vaccuum.	1.06.06/07
10.	103 JBT-TTV latching lever not seating properly.	1.06.06/12
11.	105-JT OBB outlet oil Temp. varies, check & repair.	1.06.04/14
12.	Replace coil in vaccuum flasher with SS.	1.04.14

B.F.W. CONDENSATE AND C.W.

1.	101-CA water side leak.	1.04.01/01
2.	104 J/JA discharge block valve and inspect check valves.	1.04.02/21
3.	Arrange chemical cleaning connections for the following coolers :	
	127-CA, CB, 101-JC, 108 Cs (Bottom coolers)	1.04.03
	Oil Coolers for 101-J/105 J and 103 J and	1.04.04
	Inter after condenser.	1.04.05
		1.04.06
4.	123-C outlet conductivity meter tapping isolation valve bonnet is leaking badly.	1.07.03/13
5.	The following coolers are to be cleaned :	
	116 C	1.04.07
	128 C	1.04.08
	129 JC	1.04.09
	130 JC	
	131 JC	1.04.10
	115 C	1.04.15
	Gland condenser of 101-J, 105-J & 103-J	1.04.11

Sr.No.	Description	Main Job No.
6.	123-J discharge valves are passing.	1.04.02/17
7.	Aux. boiler blow down valves are passing.	1.04.01/09
8.	Over hauling of 104-J/JA and Inspection of their turbines as speed is not increasing beyond 3500 rpm.	1.06.08
9.	123-C BFW inlet drain is passing.	1.04.01/09

BURNERS & FUEL SYSTEM

1.	To provide a double block and a PI point at D/S of block valves on naphtha fuel to individual arch burners.	.01.07
2.	Repair the naphtha leaks as per the list.	1.01.09
3.	Replace the broken burner blocks as per the list.	1.01.01

INSTRUMENT JOBS

S.No.	Description	Main Job No.
1.	101 BJT P1 - tapping isolation valve gland is leaking.	1.10.01/50
2.	FRCV-1 start hunting when output comes less than 105 psi.	1.10.01/03
3.	Thermowells installation for 103-D	1.10.01/34
4.	Calibrate PIC-7 & 8 and LCV-13	1.10.01/09
5.	Inspect the countol valve seats in refrigeration section liquid level control.	1.10.01/17
6.	Repack the glands on FICV-9, 10, & 11	1.10.01/17
7.	Check LIC-1, eye, High level alarm on 101-F	1.10.01/02.03 & 13
8.	Check valve seats for following : LCV-12, LCV-13, LCV-14, FCV-12 and FCV-14 & FCV-13	1.10.01/17
9.	Install vibration probes on compressors and Turbines.	1.10.02
10.	LCV-13 is passing. Replace the plug.	1.10.01/17

STEAM SYSTEM

M.S.HEADER

1.	101-JT, 105 JT steam inlet valves are hard to operate.	1.04.02/02
2.	103 JAT senstinal RV passing.	1.07.01/01
3.	Drain valve to be elevated above flooring. FRC - 2	1.04.02/03
4.	103 JBT T.T.V d/s drain valve line flange is leaking.	1.04.02/04
5.	104-J TTV gland is leaking.	1.04.02/06
6.	V-7 steam header drain valve is passing badly.	1.04.02/07
7.	101-JT/U/S drain valve bonnet is leaking.	1.04.02/08

Sr.No.	Description	Main Job No.
8.	103 JBT drain valve is passing.	1.04.02/09
9.	101 BJT-TTV 1st drain valve gland is leaking and box is to be removed.	1.04.02/12
10.	Bonnet leak of check valve on purging steam to SP-75 (102-E A/B) silencer near PRC-4 platform.	1.04.02/22
11.	104-JT/JAT steam inlet block bypass valves and drains are passing badly. Needs replacement.	1.04.02/13
12.	103-JAT exhaust isolation valve and its bypass arepassing badly	1.04.02/14
13.	Replace the bypass valve on V-7 on steam inlet to 107-JAT.	1.04.02/15
14.	104-JT/JAT steam admission gov. valve d/s flange near turbine are leaking.	1.04.02/16
15.	Provides second isolation valves on snuffing steam to vent silencers. Locate the valve nearer to main header.	1.04.02/17
16.	Remove box from the D/S block valve on steam to NG feed preheat coil.	1.04.02/23

H. S. HEADER

1.	103 JAT TTV is passing badly.	1.04.02/04
2.	The drain valves and bypass block valves are to be replaced around steam let down station.	1.04.02/18
3.	H.S.header drains are all passing. Repair/ replace. Provided two new valves.	1.04.02/19
4.	Provide a new valve U/S of strainer drain valves at 103-JAT. Strainer drain valves and gland are leaking.	1.04.02/24

S.No.	Description	Main Job No.
	L. S. HEADER	
1.	3.5 kg. steam valve to 111 CA/B struck. check and repair.	1.04.02/20
2.	Gland leak of isolation valve gland of 103-JAT is leaking.	1.04.02/11
3.	Replace the patched up steam inlet line to MEA reboiler.	1.07.02/06

PREVENTIVE MAINTENANCE JOBS

1.	101-J LP/HP case to be over hauled.	1.06.02 & 03
2.	105-JT inspection of rotor	1.06.04/09
3.	105 J checking all bearings.	1.06.05/04
4.	104-J/JA thrust bearing inspection and end float.	1.06.08
5.	103-JBT and 101 JT rotors to be checked if 105-JT rotor found to have deposites.	1.06.04/09
6.	Open coupling guards on all the compressors and clean sludge and deposite, if any.	1.06.02/16 1.06.04/19 1.06.05/05 1.06.06/05
7.	101-J/105JL. O pump coupling grease to be replaced.	1.06.05/13
8.	Clean externally aux. boiler tubes, convection coils and reformer tubes and check clearance of convention coils from furnace wells.	1.04.01/08
9.	Overhaul 101-J/105J L.O. turbine and pumps.	1.06.05/12 & 13.
10.	Overhaul 103-J L.O/S.O Pumps and turbines.	1.06.06/11
11.	Hydrotest boilers and steam drum and 112-C	1.04.01/10
12.	Float RVs on steam drum and steam header.	1.07.01/02

Ammonia Plant

Sr.No.	Description	Main Job No.
13.	Testing/Overhauling of all the relief valves in the plant.	1.07.01
14.	Provide hydraulic governors for coppus turbines.	1.06.07

LIST OF CATALYST CHANGES DURING ANNUAL TURN AROUND IN 1979

1.	Primary Reformer	1.01.04
2.	Secondary reformer	1.02.01
3.	H.T.S. Converter	1.03.01
4.	Methanator to be reviewed watching the performance in coming months.	
5.	Synthesis converter catalyst.	1.05.01

LIST OF INSEPCTION JOBS TO BE DONE IN THE FORTHCOMING TURN AROUND IN AMMONIA PLANT, 1979

1.	Primary Reformer	1.01.06
	a. Radiography	
	50% of the field welds of bottom Headers & Riser tubes to be radiographed.	1.01.06/01
	b. Dye penetrant test.	1.01.06/02
	All top butt welds of catalyst & Riser tubes to be subjected to this examination. We will check at random the middle and bottom butt welds.	
	Inspection of all the bottom Headers. Dye penetrant test to be carried out on header butt welds.	

S.No.	Description	Main Job No.
	c. Creep Measurement.	1.01.06/03
	d. Ferrite measurements.	1.01.06/04
	e. Inspection of refractory of Auxiliary boiler, convection zone and radiation zone	1.01.03
2.	Visual Examination	
	Visual examination to be carried oout for the following vessels.	
	a. CO_2 absorber 101 E	1.09.02
	b. CO_2 stripper 102 E (A&B)	1.09.03
	c. Condensate stripper 104 E	1.09.04
	d. Raw Gas separator 102 F	1.09.05
	e. CO_2 knock-out drum 103 F	1.09.06
	f. Steam Drum 101 F	1.04.01/06
	g. Secondary Reformer 103 D	1.09.07
	h. Synthesis converter 105 D	1.09.08
	i. Shift Converter HTS 104 D	1.09.09
	j. Transfer line 107 D	1.01.13
	k. Ammonia separator 106 F	1.09.11
	l. Transfer lines from 103-D to 101 CA/CB	1.09.01
3.	Heat Exchangers	
	a. Visual inspection of tube bundles.	1.09.10/01
	b. Radiography & stress relieving of welds for synthesis after cooler 124-C	1.09.10/02
4.	Pipe Lines Thickness Survey	1.09.12/01

MEA - 1 300 MEA - 2 - 100 MEA - 3- 100

MEA - 7 300 MEA - 10 AB-300 MEA -11- 350

MEA - 25 80 MEA - 26 AB-62.5/37 MEA-29AB-300

MEA - 12 AB 300 MEA - 15AB-300 MEA-20 - 300

MEA-27AB - 450

CO - 1 AB 450 CO - 7 - 600 CO - 6 AB - 450

PW - 1 150 PW - 4 - 62.5 PW - 5 - 50

PW - 8 37.5 PW - 19 - 150/100 PW-20AB- 150

PW - 29 AB-250 PW - 31 - 300 PW - 17 - 100

S.No.	Description	Main Job No.

PG - 3	-450	PG - 6	-450	PG - 10	- 450
PG - 13	-400	PG - 15	-350	PG - 14	- 400
PG - 18	-300	PG - 21	-500		
SG - 11	-250	SG - 12	-350	SG - 6	-300
SG - 13	-300	SG - 18	-450	SG - 22	-300
SG - 23	-300	SG - 33	-350	SG - 35	-300
SG - 42	-100	SG - 44	-100	SG - 34	-350
SG - 62AB	-100				

5.	Boiler blow down line bends.	1.09.12/02
6.	Steam let down station elbows (PTC - 13 area)	1.09.12/03
7.	Inspect synthesis converter internals.	1.09.12/04
8.	Inspect the bends on H.P. BFW lines to 101-F.	1.09.12/05

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MODIFICATION JOBS

S.No.	Description	Main Job No.
*1.	Strengthen the foundation for Primary Reformer.	1.08.03
2.	Replacing aux. boiler burners with combination type and hook up of new naphtha and steam headers with existing.	1.08.02
3.	Provide double blocks and bleeder on Naphtha fuel to arch burners.	1.07.07
4.	Relocate NG separator near GMS to clear area near PGR Plant.	1.08.05
*5.	Install new SP - 73	1.08.07
6.	Replace air mixer with John Zink	1.02.01/09
*7.	Provide control valve on steam line to air coil	1.08.08
8.	Provide tappings for PGR Plant.	1.08.06
9.	Provide cooling gas tappings for methanator	1.08.09
10.	Install 104-J condensing turbines and connect exhaust with surface condenser.	1.08.01
*11.	Provide 3" bypass for PRC-2 on steam to Primary reformer	1.08.12
12.	Provide additional high level alarm on 129-JC/130-JC	1.08.13
13.	Provide man-hole on 112-C	1.08.14
*14.	Installation of proximity probes on compressors and turbines	1.10.02
15.	Hook up back up power (inverter) for instruments	1.10.01/48
16.	Amine guard tappings for co2 lines exist strippers	1.08.04
17.	Cooling gas connection from 101-D/102-D to fuel system.	1.08.16
18.	Flow meter on BFW make up line.	1.08.10
19.	107-JT ring pressure tapping.	1.08.11

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INDIAN FARMERS FERTILISER COOPERATIVE LIMITED
KALOL UNIT

AMMONIA PLANT.

Catalyst Replacement and check procedures.

PRIMARY REFORMER 101-B

1. Filling of Fresh Catalyst in socks

1.1 Two types of catalysts are loaded in the primary reformer tubes. C-11-9-03 at the bottom half and C-11-9-02 at the top half. These two varieties of catalysts differ from each other in their size and nickel content. C-11-9-03 are longer rings (size of C-11-9-03 rings = 16 mm x 16 mm x 6 mm and 6-11 -9-02 rings = 16 mm x 9 mm x 6 mm) compared to the C-11-9-02 and contain more nickel than C-11-9-02.

1.2 The catalysts are separately sorted out first. Catalyst is passed over a screen of 8 mesh size by hand and while passing all broken rings are picked up and discarded. Any catalyst which appears to have irregular shape or low crush strength catalyst rings, if loaded, will cause excessive pressure drop in any one tube. Excessive pressure drop in any one tube or more will restrict or diminish the gas flow when running and this results in over heating all along its length or localised at some particular portion. Overheating of a tube locally or wholly will be detrimental to the tube life. Therefore, effective supervision during the operation is very important. The sorted out cata-

lysts are packed in drums and once sorted out, handling of the drums should be minimum and that with extreme care, to avoid breakage of the catalyst rings.

1.3 Determine the bulk density of the catalyst 3times each of C-11-9-03 and C-11-9-02 separately and record them in the loading register.

1.4 The sorted out catalyst is then weighed accurately in batches of 5 kg and each 5 kg is loosely filled in the polythene socks. Plastic socks are cut in 9'4" length and kept stappled at one end for this purpose. The other end is stappled after filling the catalyst.

1.5 The filled plastic socks are handled carefully to avoid damage or deterioration of the plastic material as otherwise these would break while loading and will not come out easily from the tube in one piece.

1.6 The filled socks are stappled and stacked on the pellets straight. Later on for shifting only pellets are shifted without disturbing the catalyst filled socks.

1.7 While packing, packing and then stacking these packets care should be taken to avoid water coming into contact.

1.8 Catalyst socks containing C-11-9-03 and C-11-9-02 are stacked separ-ately to avoid mixing up. About

1400 socks of 5 kg will be sufficient for one type of catalyst i.e. 1400 for C-11-9-03 and 1400 for C-11-9-02.

1.9 Later on while adjusting pressure drop and topping up outage at the end of loading only the required specific weight is filled in the socks for loading. Quantity for topping up and socks length are judged from the previous outage readings.

2. Unloading of Catalyst from Primary Reformer.

2.1 When the reformer temperature reaches 50°C and blinds have been installed as per list hand over to mechanical maintenance to open the top flange of the individual tubes and also get the inlet manifold flanges opened. Get the top flanges opened row by row to facilitate simultaneous unloading also.

2.2 The vacuum blower motor should be energised. The flexible PVC hose connection should be provided for unloading the catalysts, and empty drums made ready for filling with the used catalyst near the knock-out separator. Keep mechanical vibrator or a 5 lb hammer ready for hammering the tubes.

2.3 When the above steps are ready, we are onset for unloading the catalyst. Leave open all the bottom header drains.

2.4 Start the vacuum blower and insert the PVC hose, which is smaller in diameter than the tube size.

The vacuum created shall to the knock out sepa-

rator. Unloading of catalyst from four to six tubes at a time will be done with the help of new vacuum blower. Catalyst removal from two to three rows at a time can be started.

Under normal conditions, whole of the catalyst in a tube should be removed by this vacuum blower but in some tubes it might be difficult to suck out the catalyst due to bridging. In such cases, hammering at the side of the top flange of the tubes by mechanical vibrator/hammer is advised. The hammering will break the bridge and catalyst will come out easily.

Catalyst unloading from 1st row shall begin and as the catalyst is removed from 1st row preparations for cleaning visual inspections, Δ P and outage should be done.

3. Inspection and Cleaning of the Tubes and Pigtails

An inspection lamp monocular, measuring tape and pressure drop measuring rig should be made ready by this time.

3.1 Use special connection for introducing air at the pigtail opening inside the tube and blow till clear air comes out of the end flange of the inlet header. Introduce vacuum hose inside the inlet header throughout the length so that dust and broken catalysts are sucked out.

3.2 Once blowing and sucking of each tube is done, and the tube is thoroughly cleaned the inspection of

tubes by lowering the inspection lamp is to be carried out. It is to be thoroughly observed that all the 19 holes that are at the bottom of the tubes are clear. This can be seen by monocular.

If the holes are blocked by dust or catalyst pieces, clear them by using round hammer first and then punch if necessary. Ensure, both these are secured properly with the nylon rope.

Once all the holes are cleared and no catalyst is there in the tubes, proceed as under.

4. Taking outage and Checking of Pressure drop of empty tubes.

4.1 Outage of each tube is checked with the measuring tape with the weight attached from top flange to the bottom grid. The outage has to be in the range of 35'-6¼" to 35'- 6 1/8". Any outage that does not fall within 10% plus or minus of the average outage of all tubes, is to be inspected once again by monocular with inspection lamp lowered inside.

4.2 After the outage is measured blow air into the tubes and then measure pressure drop of all the tubes. The pressure drop should be in the range of 0.30 to 0.31 kg/cm^2 at the air pressure of 70 psig at the rig. If any excess pressure drop is observed, repeat air blowing till desired pressure drop is attained.

The pressure drop test rig has a plumber's plug which should be inserted into the tube below the pigtail connection. Care should be taken to ensure that plumber's plug is tightly sealed against the inside wall of the tube after tightening the rig to the tube top flange by ensuring no air leak at the top. Each tube is to be blown with Instrument air for approximately three minutes, using the test rig for this operation. A flow of air sufficient to maintain 70 Psi at the rig inlet should be maintained. After air blowing is completed, read back pressure on the second gauge.

When the fixed flow has passed through each tube and pressure drop recorded, all readings are 5% plus or minus of mean value loading is to be started.

4.3 Step nos. 3.2, 4.1, 4.2, are to be recorded immaculately in the chart which shall be furnished. Inspection is to be carried out for all 336 tubes.

5 Catalyst Loading

While the inspection, blowing with air and pressure drop of empty tubes are in progress, preparation for loading of the catalyst can be done. Two types of catalyst C-11-9-03, C-11-9-02 are loaded in the reformer tubes; former being bigger in size than the latter. C-11-9-03 loading is done first and then C-11-9-02 loading is done.

Loading of C-11-9-03 Catalyst.

5.1 Socks filled with C-11-9-03 catalyst are brought. Load two socks of 5 kg each full of catalyst one by one in each tube. Remove the stapples on either end. Tie a knot around the hook of the lowering rope at one end. The other end is folded a few inches back. Lower the sock gradually into the bottom of the tube. Unfolding is achieved by pulling up a few inches and giving a gentle jerk. Catalyst gets dropped inside the tube by this. Gradually pull the sock up. Inspect it again to ensure that whole of catalyst has gone in the tube and no piece of the sock is left behind. If any piece of sock is left behind, empty the tube and repeat all over once again. Do not allow the catalyst to have a free fall more than two feet.

5.2 Two socks of 5 kg each i.e. 10 kgs of first instalment of catalyst filling is to be done. After all the tubes of one row have been loaded with 10 kgs. of C-11-9-03, check the outage, vibrate for 20 to 30 seconds each tube and again take the outage and these readings are to be recorded in sheets furnished.

5.3 Again two socks of 5 kg. each i.e. another instalment of 10 kg. is to be lowered into the tubes. This means now the tubes contain 20 kgs. of C-11-9-03. Take the initial outage, vibrate for 20 to 30 seconds and find out the final outage.

In case if any sock piece gets stuck inside the tube, empty the tube. Repeat the inspection and loading.

5.4 Third increment of catalyst of C-11-9-03 has to be loaded in each tube. Once all the tubes are filled with 25 kgs. of this catalyst, initial outage is to be taken and then vibrated with vibrator for 20 to 30 secs. Then again find out the final outage. All the readings should fall within the 10% minus or plus of average reading. Average outage of each tube after loading of 25kg C-11-9-03 should be around 18' - 10".

5.5 Pressure drop of each tube is to be checked after 25.0 kg of C-11-9-03 catalyst are loaded. The pressure drop should be necessarily within 10% of average reading. If any reading does not come within the stipulated range, unload the whole catalyst tube and reload it with the above mentioned procedure and get the desired pressure drop in every tube.

6 Loading of C-11-9-02 Catalyst.

Smaller size, C-11-9-02 catalyst loading can be carried out, when C-11-9-03 loading is complete in all the tubes as per above procedure.

6.1 5 kg socks of C-11-9-02 catalysts are also prepared. Two socks i.e. 10 kg of 1st batch of catalyst is to be poured into all 336 tubes. Note the initial outage. Vibrate for 20 to 30 secs. and then note the final outage. Same precautions and procedure are to be followed for both the types of catalysts.

6.2 Another batch of 2 socks i.e. 10 kg of second batch is augmented in the catalyst tubes. By now we have 25.0 kgs. of C-11-9-03 catalyst and 20.0 kgs. of C-11-9-02 catalyst. Here again note the initial outage, vibrate it for 20 to 30 seconds and get the final outage.

6.3 Last batch of C-11-9-02 catalyst has to be added as per the final outage. The catalyst is filled upto the final outage of about 2 ft. 5 inches from top flange. This means that different tubes will hold varying amount of C-11-9-02 catalyst. Some tubes will accomodate 3 kgs. Some 3½ kgs. and likewise. So, for convenience sake, some socks of 3 kg., 1 kg are to be prepared. It may be necessary to charge different weights in different tubes for getting the outage. Weighing will have to be done then and there for this batch.

6.4 When the final outage has been adjusted by the addition, last batch of C-11-9-02, final pressure drop of the each reformer tube has to be found out. Each tube has to be blown with dry and oil free air blowing is over, pressure drop test can be carried out. A stable pressure of 70 psi upstream of ¼" R-O is maintained at the upper pressure gauge on the rig.

When this fixed flow has passed through each tube and the pressure drop recorded, all readings within 5% plus or minus of mean value can be considered as having been loaded correctly. Tubes in which the differential is in excess of this allowable

deviation will have to be corrected by vibrating none or reloading as the case may be and tested again as described in the procedure above.

When all the tubes have been correctly loaded and with outage and differential pressure within limits, top flanges are boxed up.

6.5 All the catalyst tubes are to be buttoned up and it should be seen that new gaskets are put in service and tightly bolted. Box up the inlet header and flanges with new gasket.

6.6 Take care not to drop any foreign material at any stage of operation in the tube. In case any foreign materials has fallen in any tube accidently. Inform shift engineer so that arrangements for removal can be made.

Personnel working for loading the catalyst should not carry with them anything like pens, pencils, torches, etc. or any article which can go inside the tube. Any such thing that is used for the operation should be secured with a cord or nylon rope. The rope end should be tied to any structure on the pent house. This will facilitate recovering the material from tubes without difficulty.

6.7 When all the tubes are boxed up, start purging with IG. When O_2 content comes down below 0.5% blinds can be removed keeping IG positive pressure.

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INDIAN FARMERS FERTILISER COOPERATIVE LIMITED

KALOL UNIT

AMMONIA PLANT

Catalyst Replacement and check Procedure

C.P. SYNTHESIS CONVERTER 105- D.

INTRODUCTION

Catalyst used in ammonia converter is promoted iron and the catalyst after activation is pure elemental form. When it is exposed to oxygen in air it catches fire releasing too much heat. The heat then generated can cause temperatives high enough to damage the internals of the converter and to the personnel handling it. In addition to this the ammonia present in the catalyst even after purging with nitrogen or inert gas is prohibitively high for personnel entry without adequate precautions. This necessiate elaborate preparations for discharging the catalyst from a converter after a period of service. Preparations are for rendering the catalyst temporarily passive till it is discarded in a safe location.

Similarly the opportunity is also used for internal inspection of the converter. Considering the difficulties in dishcarging and recharging the converter with new catalyst, the time and production loss involved in the operation and the cost involved it is needless to stress the importance of a thorough and systematic inspection of the converter during this time.

-x-x-x-x-x

The performance of any catalyst, its activity and longivity are directly dependent on the correct methods employed in loading the catalyst. This along with the factors mentioned in the previous paragraphs adequately explain the necessity in taking extreme care and close attention warranted during all the three stages of the operation, viz. Catalyst discharging, converter internal inspection and reloading of new catalyst.

The detailed procedure laid out after several discussions and collective thinking in the light of other ammonia plant operators experiencing, is to be adhered to for changing the catalyst in our ammonia convertor 105-D during the ensuing annual turn around.

1. Shut down back end of ammonia plant. Isolate 106-F, 107-F & 108-F and drain these vessels completely.

2. Put 103-J on complete kick back with SP-1 & SP-70 wide open. Cut off complete purge. Upset the make up gas ratio and keep the quenches wide open to all four beds. This is for killing the reaction and to cool the catalyst beds as low as possible with 103-J running and gas circulating. Watch the loop pressure and hold it around 80 to 90 Kg/cm^2.

CAUTION : 123 has been found leaking. To avoid water enterin the racycle compressor maintain the steam drum pressure about 10 Kg/cm^2 less than the loop pressure.

3. When reaction is completely killed and beds show no tendency to cool down further close SP-70 and SP-1. Stop 103-J and 105-J as per the normal procedure. Keep 103-J suction valve open and vent the gasat PRC-4. Open V-25 and MIC-12. Depressure loop to 10 to 12 Kg/cm^2. When pressure reaches this level open SP-1 bypass slowly and continue gas flow through the converter venting at V-25 and MIC-12. This gas flow is expected to sweep all the ammonia from loop and to cool the catalyst beds further. Try to maintain maximum flow keeping the differential pressure across 105-D and 121-C within the permissible limits.

During this operation blow out all the vents and drains to avoid any pockets. Remember H_2 is coming out of these points now. No hot jobs should be going on in the vicinity of any open drain at this time. Also remember no combustible gases should be blown to the underground drains/sewers.

4. When temperatures in the beds have been lowered to 60°to 70°C and no further cooling has been found possible, close SP-1 by-pass. Stop flow of process gas through the converter. Allow to depressure the loop to just positive pressure and close V-25 and MIC-12. If these vents are not depressuring the loop low enough due to vent header back pressure use other drain and vent points.

   Also if process gas flow in the normal route is not cooling the convertor to required 60°C to 70°C, IG/N_2 connection to be used for cooling the beds to this level.

5. Hook up IG/N hoses at start up heater u/s drain and at pdI tapping d/s of MIC-13. Draw the N_2 at the drain points at the converter outlet line to achieve cooling to 60°C to 70°C. In case cooling could be achieved by process gas itself this step No.5 will not be required. In that case use these connections to purge out H_2 and NH3 content in the loop to 0.2% H_2 & 50 ppm NH_3 by pressurising and depressurising. pressurising to be done as high as possible and depressurising as low pressure as possible.

   In case IG is used for this operation. Quality of IG is to be ensured to contain 0.2% O_2. Even if quality is assured by regular analysis a constant and continuous watch is to be kept for any abnormal rise in the catalyst temperature. If any rise is observed disconnect IG and use bottle nitrogen for this purpose but taking the same preeautions.

   During this purging clearance can be given for mechanical/maintenance for removing alternate bolts on the flanges to be blinded. And even inserting blinds also to be made possible taking necessary precautions to save time.

6. When H_2 content in the loop is 0.2% and NH_3 is 50 ppm complete blinding the connections. For blind locations refer drawing No. I. while blinding ensure that only one flange is spread at a time for inserting the blind. Before releasing for blind insertion

install a manometer at pdI-50 and read constant and continuous possitive pressure in the convertor. Out of two connections for IG/N_2 mentioned in step 5 one to be changed to bottle nitrogen as for an emergency supply if not already in use.

7. When all the blinds (8 Nos. total) are in position and seperate IG and bottle N_2 connections are made, position pressure is monitored on the manometer get the converter bottom shell cover opened. As this opening will release N_2 or IG in the enclosed space inside the converter skirt the personnel working inside should be provided with air line breather.

8. When bottom shell cover is dropped N_2/IG starts coming out from the ennulus space at the shell opening. adjust N_2/IG flow to maintain positive pressure inside. Seal this annulus with asbestos or rubber tube to prevent N_2/IG loss. Install the split flange at the shell opening the support this seal.

9. Check for presonce of any explosives gas mixture around the opening and confirm the absence. When absent get three lugs welded on the drop out pipe blind flange. When the lugs are welded support this flange with slings strong enough to support this flange in position with the weight of the catalyst acting on it and bolts removed. The slings are passed through pullys to facilitate opening the flange and closing it by the slings attached to it from outside the skirt for discharging the catalyst.

10. When step-8 is completed install the hopper and conveyor Connect water to the sapgers inside the hopper and along the conveyor. Keep a fire hose ready for wetting the catalyst when transferred to the truck. Call the fire tender and station it stand by. Start conveyor and confirm proper running.

When all the above preparations are completed and proper working of the conveyor and hopper are confirmed get the drop out blind flange opened through the hopper access door. The slinge [illegible] should be supporting the flange when all bolts are removed. Close the hopper door and secure firmly.

Maintenance personnel and others working inside the convertor skirt at this time should be using air-line masks as safety against N_2 atmosphere and posseible high ammonia content in the space.

11. When all the above steps are completed we are ready to discharge the catalyst from convertor. The status will be

a. The drop out blind flange bolts removed and supported by slings.

b. Hopper and converyor installed and conveyor running

c. Water open to all the spargers.

d. trucks ready to receive the discharged catalyst.

e. Fire tender standby

f. IG/N_2 positive pressure in the converter

g. Drop out flange botls all removed and supported by slings in position.

12. Slowly open the drop out blind flange by manipulating one of the slings. When flange is lowered first alumina balls start coming out and get collected in the hopper. Discharge the alumina balls to the conveyor by opening the hopper door. Receive in the truck. Close the blind flange and hopper door to avoid catalyst mixing with alumina balls. Dump alumina balls alone separately for washing, cleaning and sorting them prior to recharging the reactor. Dry the alumina balls after washing and store them in a clean drum. After salvaging the alumina balls continue discharging the catalyst in the same manner.

WHILE DISCHARGING THE SPENT CATALYST ENSURE POSITIVE NITROGEN/INERT GAS PRESSURE IN THE CONVERTOR BY ADJUSTING THE FLOW ACCORDINGLY.

DISCHARGED CATALYST SHOULD BE THROUGHLY WET BEFORE IT IS EXPOSED TO AIR, KEEP IT THROUGHLY WET UNTIL IT IS DUMPED AWAY IN THE AREA SPECIFIED.

FIRE TENDER TO FOLLOW EVERY TRUCK CARRYING AWAY THE DISCHARGED CATALYST TO AVOID OVERHEATING OF THE CATALYST BY ANY CHANGE(This operation will reviewed after actual experience).

13. Keep the dumped catalyst thoroughly wet by hooking up a fire hose in the yard till complete catalyst is discharged from the converter to keep the area congenial for dumping operation.

14. Continue this operation till the catalyst freely flows from the converter. When flow stops use the drop out rod provided in the converter for shaking the bed for further discharging. The prefabricated extension to be used through the access door on the side of the hopper for this purpose.

In case the builtin poking facility also would not shake the bed and discharge more catalyst use the alternate arrangement i.e. the rod in segments of 5' long and connected by the sockets with tappered ends to poke the bed. CARE TO BE TAKEN NOT TO DAMAGE CONVERTER INTERNALS WHILE DOING THIS.

IMORTANT KEEP ALL ALONG IG/N_2 POSITIVE PRESSURE INSIDE THE VESSEL.

15. When all the above efforts when repeated would not discharge any more catalyst it is assured that further loading be done by wet method. Remove the hopper. Remove the rod extension and the poking rod. Remove the drop out blind flange. Remove the split flange at the annualus. Install the flange with nozzles and valves prefabricated keeping continuous N_2/IG flow to avoid any air entry to the vessel. Connect the PVC hose for water level

indication inside basket. Mark the height of water i.e. 55' from the drop out pipe flange on the tube. Hook up a fire hose for D.M. water to the water filling nozzle. When all connections are ready start filling the vessel with water up to the marked level on the PVC tube.

16. When water has been filled to the desired level increase IG/N_2 flow and keeping continuous positive pressure inside vessl start draining. Drain out complete water.

17. Repeat the filling and raining once again.

18. When twice the filling and draining have been done fill the basket for the third time. By doing thus it is expected that the catalyst would be wet thoroughly, ammonia dissolved in water and drained and bed temperatures lowered enough for vessel entry.

19. When basket has been filled the third time keeping the vessel under N_2/IG atmosphere get the shell man-way opened. Hook up a DM water hose at the man-way platform.

20. When shell man-way has been opened get the maintenance personnel wearing air line breathers open the basket man-way inside the shell. Take care not to drop any tools, nuts, bolts, etc. in the annular space while working.

21. When basket man-way has been opened hook up a bottle N_2 hose at converter outlet line and purge this line to avoid any entrapped hydrogen evolved during water filling. Also continue N_2 flow from the start up heater end and MIC-13 for about half an hour. This blowing with N_2 coming out of the basket man way from both the directions should drive out the hydrogen if any in the vessel and connected inlet outlet piping.

22. On completion of half an hour blowing aspirate a sample from the atmosphere above water level in the first bed and analyse for any hydrogen present. Continue this blowing till H_2 content drops down to 0.5%.

23. When hydrogen analysis shows 0.5% disconnect all the three N_2 connections and connect air start up heater inlet and MIC-13 and purge out N_2 with air inside the basket. Hook up another air hose near HCV-11 and purge the convertor shell also.

24. When sufficiently purged with air flow the heighest rate available check for O_2 content in the basket above water level. When three consequitive analysis show about 20% $\pm$ O2 vessel is ready for entry.

25. Personnel entering the vessel should have walkie-talkie. Talkie communication with personnel outside and catalyst bed ensured to be completely submerged in water Air flow at the MIC-13 and start up heater inlet

should be at full rate to ensure ventilation. Basket internals should be well illuminated with flood light from outside. One person should be watching the inside continuously. A rescue team of two persons wearing air line mask should be ready stand by to bring the personnel detailed for working inside in case of any untoward eventuality. DM water to be open at the hose connexion kept at the platform near the shell man-way. When all these preparations are ready men wearing air line masks enter the vessel with necessary appliances for sweeping down the catalyst to second bed. During this period constant contact be maintained through walkie talkie with outside vessel. Personnel inside should be careful while placing every step not to get caught in the three drop out openings on the catalyst support which are of 4" dia, big enough for a mans foot.

No sharp tools or metal brushes to be used for brushing the basket internals. Only hard fibre brushes or brooms to be used. Water to be used for flushing till all the catalyst sticking at the sides be transferred. If catalyst remains exposed for longer periods there are chances of getting heated. Hence the importance of running DM water hose inside while cleaning.

26. When all the catalyst has been transferred to the second bed call the personnel out. When all personnel are outside the vessel tower the water

Level below the first bed and above the second bed top surface water lowering should never be done when personnel are in side the vessel. Change the air house from 1st bed to the second bed quench and open air.

27. When water level has been lowered as above get the first bed bottom manway opened. When the manway has been opened carry out the same operation as in first bed, with air flow going at the respective quench.

28. First, second and Third beds are cleaned in the same manner with air flow going through the respective quench.

Whatever catalyst comes out during lowering of water level should be carried away to the yard taking precautions earlier.

29. When third bed has been emptied and the manway is open, 4th bed cleaning to be started. Fourth bed is different from other beds in many ways. This is the biggest bed and has no screen support. This has a smooth finished refractory bottom. Fourth bed cleaning is done by using a gentle JET of DM water and flushing it out through the drop out opening simultaneously conveying it to the truck.

VERY IMPORTANT NOTE

a. Before discharging the spent catalyst and wetting it with water under no circumstances it should be exposed to air. Ensure positive Nitrogen or inert gas pressure.

b. Under no circumstances water should be allowed to enter the annulus space as this would damage or deteriorate the thermal barrier between the shell and the basket.

c. Under no circumstances water of any quality other than DM water should be allowed to enter the convertor.

d. Ensure abundant air supply through the respective quench ring when personnel are working inside the catalyst basket.

e. Personnel working inside the vessel should be under the constant vigillent observation from personnel posted outside ready for rescue operation and will protected themselves. One person also should be on guard of the catalyst discharge stop valve while personnel working inside to avoid any one opening this valve by mistake.

f. Any time wet catalyst is to be discharged DM water must be opened inside and rate of discharge be moderated to avoid exposure of the catalyst. Because water will have a tendency to drain out faster than the catalyst.

g. All personnel and appliances should be brought out before attempting to discharge the wet catalyst.

CLEANING & DRYING OF THE INTERNALS.

When all the catalyst has been discharged wash the internals thouroughly with DM water use a hard fibre brush to clean the screens and supports. When completely cleaned remove all the flanges and connections from the drop out pipe flange. Install an air mover at the top most manway on the basket to draw air from inside and deliver outside. Run the air mover till it is dry completely. Keep an air flow alternating between the quench rings to drive out any entrapped water.

"PRECAUTIONS" & "CHECKS" OF AMMONIA CONVERTER AFTER DUMPING CATALYST.

a. Precautions on Dumping and Reloading of catalyst:

1. Care must be taken in entering and leaving the basket after dumping and during re-loading of catalyst.

b. Swabbing materials for cleaning shall be cotton or other absorbent materials. These shall be tested to assure 2 ppm maximum soluble chlorides and freedom from other salt contanimation.

c. All personnel entering the basket should be checked to be sure that they do not introduce dirt, salts, or other contaniments and should wear absorbent sweatbends, clean cotton gloves, clean slippers and clean work clothers.

d. Chloride content of each batch of catalyst should be checked for having a maximum water soluble chloride of 10 ppm before reloading. Chloride analysis of each batch of catalyst is obtained through the manufacturer of the catalyst. Damaged catalyst containers should not be used for re-loading.

2. Inside surfaces of basket and all components shall be cleaned free of all dirt and debris prior to re-loading of catalyst.

B. Check-list for the Basket After Dumping of catalyst:

1. Check screen at the junctures of dished-grids and

a. Gas-return pipe
b. Catalyst-drop out pipes.
c. Thermowell pipes
d. Quench pipes

and look for possible loose or warped screens due to thermal expansion, wire or weld in place.

3. Check screen on gas return collector similarly as items 1 & 2.

4. Check screen for possible nitrite deposits.

5. Check interior surfaces of basket and visually examine for possible cracks.

6. Check for possible deformation or warping of gas return pipe, quench lines and thermowell pipings.

7. If basket bottom is lined with refractory, check for possible cracks on the concrete surface.

8. Check for possible breaks or rips on flexible hoses.

Preparation of Catalyst before loading.

1. Catalyst should not be exposed for long periods to sun light and moisture in the air. Water in any form should not contact the catalyst.

2. Catalyst drums have been dirtied while handling. Lot of dust and sand stick to the drums. Therefore these drums should be brushed to clean externally before dumping on the screens to avoid contamination due to these foreign particles.

3. Catalyst is generally packed after screening. But while shipping the catalyst and handling at site it is likely to get crumbled and a little dust might be formed. As this dust can cause excess pressure drop if allowed inside catalyst should be screened before loading. An 8 mesh screen is used for screening. While screening it is not to be vibrated. Catalyst should be passed over the screen gently by gloved hands. Naked skin and sweat should not be allowed to come in contact with catalyst at any stage while handling.

4. The catalyst after passing over the screens should directly be charged to the converter or should be packed in clean drums if done in advance. All drums should be closed air and water tight.

5. Two to three times the bulk density of the catalyst is determined before charging to each bed. The average bulk density to be recorded for each bed separately.

6. The catalyst has been separately marked for different beds. These are to be screened separately and the screened catalyst in durms should be marked specifically and stacked separately to avoid inter mixing of the catalyst meant for different beds.

7. Under no circumstances foreign materials like, snad, dust, stone pieces, cotton wool etc. should be allowed to mix with catalyst while screening and subsequent loading in the vessel.

Catalyst Loading of Ammonia Converter.

1. When drying, cleaning and Inspection are over the converter is ready for loading. Once cleaning is complete no personnel should enter the vessel without wearing hand gloves, over all with full sleeves and boots covered with canvas socks. Under no circumstances basket internals should come in in contact with rubber materials like shoe bottoms. The over-all, gloves and socks should be clean and should not be greasy or oil soaked.

2. Install the bottom drop out blind flange. The lugs welded earlier at unloading time should have been removed and flanges should have finished face.

3. When bottom drop out flange is installed vacuum out the dust from the bottom of the 4th bed basket. Leave the vacuum hose inside to suck out the dust which appears when catalyst loading starts. Hook up a hose for clean air at the 4th bed quench and open air for ventilation.

4. When the above preparations are over enter the vessel and mark the height of the ¾" alumina ball bed and 3/8" alumina ball bed and the top level of the catalyst bed.

5. Place the catalyst loading hopper at the man-way platform and secure it properly. Fix the PVC hose at the tail of the hopper and free end of the hose is taken inside the bottom bed compartment in a zig zag path. The hose should be coiled one round each insideevery compartment of the basket. This prevents the catalyst falling freely from the top directly to the bottom.

6. Load ¾" alumina ball at the bottom through the hopper and PVC tube. Move the bottom end of the hose to pack the ball evenly and avoiding voids. Pack it up to the marked height. When packed bring in the duck board for personnel to stand on.

7. When ¾" alumina ball is loaded standing on the duck board load the 3/8" alumina ball to the marked height. Level it evently. Take the dip from the catalyst level using a tape.

8. When both the sizes of alumina ball loading are completed and levelling done bring in catalyst the same manner. Exact weight of catalyst loaded to

be recorded. Weight the bucket empty. Then empty the drums to the bucket. Note the weight. Record Bucket number, tare weight gross weight and the actual weight of the catalyst while loading in a register. While loading catalyst every one foot height catalyst should be levelled evenly. Height of the bed is judged by taking frequent dips from the marked top level and taking the difference from initial dip. While loading the catalyst move the loading hose end all around to drop the catalyst evenly at all the sides. Hose should be kept low enough to avoid any fall of catalyst more than two feet. Take care to pass the hose near the wall sides and thermowells to avoid voids.

10. At every 3 feet height vibrate the catalyst use the concrete vibrator for this purpose. Keep the vibrator running continuously. The running vibrator is pressed down inside the bed at points one foot apart. Do not hold the vibrator inside the bed longer than 2 seconds to avoid catalyst crumbling. Vibrator should be pressed inside the bed about 1 foot away from the walls, drop out pipes, riser pipe and thermowells. Closer than this might crumble the catalyst. As soon as vibration is completed the vibrator is kept away from the loading surface till next using

11. Catalyst loading is done in the bed till the prescribed weight is loaded or to the height marked on the basket which ever is earlier. The height marked is the maximum bed height. Levelling, vibrating and

spreading the catalyst uniformly is the success of this operation and that is our aim.

12. When 4th bed has been loaded to the required height take out all the loading appliances. One senior operation man to inspect the bed top. Clear for boxing up the next upper bed bottom man way. Maintenance personnel entering the vessel for this job should also observe the same precautions. In addition he must ensure the tools carried inside are brought back outside after completing the work.

13. When bottom man way is closed repeat all the above operations except the alumina ball loading till completing the first bed loading.

14. While loading as the catalyst level rises the hose length will have to be reduced. Mark the excess length on the hose. Empty the hose and hopper. Pull it to the next higher bed. Cut it without using a saw and dropping the dust inside. Clear the upper hed and hose end before restarting loading.

15. When the top bed is completed vacum out the dust and debris if any from the cross over between the shell man way and basket man way. Then remove this. Get the basket manway boxed up.

16. When basket manway is boxed up Box up the shell man-way and the bottom shell cover.

17. Start purging the vessel with nitrogen/IG till O2 content drops down 0.2% by pressurising and depressuring.

18. During this purging time the vessel blinds can be removed one by one if 123-C repair is complete.

AMMONIA PLANT JOB GROUPS

Sr.Job No	Description	Time
1.01.01	Replacement of damaged burner blocks (101-B)	13 days
1.01.02	Replacement of bottom header insulation in 101B	8 days
1.01.03	Refractory repair as required	5 days
1.01.04	Primary reformer catalyst replacement	17½ days
1.01.05	Inspection of reformer tubes by MFL	4 days
1.01.06	Reformer tubes inspection by inspection section	5 days
1.01.07	Provide additional naphtha valves for burners	10 days
1.01.08	Inspection of spring supports for reformer tubes for 100sc bolts & nuts, repair it.	
1.01.09	Rectify defective valves on 101 B	2 days
1.01.10	I.D. fan rotor replacement	13 days
1.01.11	Replace I.D. fan turbine nozzle for uprating	5 days
1.01.12	I.D. fan preventive maintanance	5 days
1.01.13	Inspect transfer line 107D, repair as reqd.	1 day
1.01.14	LT Super Heater coil support to be strengthened	
1.02.01	Replace 103 D catalyst & replace air burner	15 days
1.03.01	Replace HT shift convertor 104D catalyst replacement	8 days
1.03.02	SP-71 isolation valve & control valve repair	4 days
1.03.03	Repair LTS outlet drain valve	2 hours
1.04.01	Boiler inspection & Hydraulic testing	13 days
1.04.02	Steam leakages & valve repairs	13 days
1.04.03	127-C A/B chemical cleaning	100 hours
1.04.04	101 JC Chemical cleaning (Tube side)	110 hours
1.04.05	Chemical cleaning of 108 CS (Tube side)	102 hours
1.04.06	Chemical cleaning of lub oil coolers	68 hours
1.04.07	116 - C Cleaning	110 hours
1.04.08	128 - C Cleaning	38 hours
1.04.09	129 - JC & 130 JC Cleaning tube side	98 hours
1.04.10	131 JC Cleaning	74 hours
1.04.11	Cleaning of gland condenser of 101 J	32 hours

Job No.	Description	Time
1.04.12	Replacement of 108C for absorber side tube bundle	4 days
1.04.13	Replacement of 124 C tube bundle (By M/s Anup Engineering. Ahmedabad)	18 days
1.04.14	Replace steam coil of vacuum flasher with SS lines	- -
1.04.15	115 - C Cleaning	5 days
1.05.01	105 D converter catalyst changing	18 days
1.06.01	P.M. of 101 JT turbine	30 hours
1.06.02	P.M. of 101 J H.P. Compressor	100 hours
1.06.03	P.M. of 101 J L.P. Compressor	120 hours
1.06.04	P.M. of 105 JT turbine	137 hours
1.06.05	105 J LP & HP bearings are to be opened	112 hours
1.06.06	P.M. of 103 J	146 hours
1.06.07	P.M. of 107 JT	76 hrs.
1.06.08	104 J/JA overhaul	- -
1.06.09	Provide hydraulic governer for coppus Turbine	- -
1.07.01	Testing & repair of RVS	6 days
1.07.02	Pipe line fabrication	6 days
1.07.03	Miscelenious fabrication & repair jobs	6 days
1.07.04	Terry Turbine installation	14 days
1.08.02	Aux. Boiler burners replacement	8 days
1.08.03	Strengthening of I.D. fan foundation	10 days
1.08.04	Amine guard tapping for CO2 line on exit of strippers	1 day
1.08.05	Relocate N.G. Separator near GMS to clear are for PGR plant	4 days
1.08.06	Provide tapping for PGR plant	4 days
1.08.07	SP 73 modify by extending it to 10'	8 days
1.08.08	Provide control valve on steam line to air coil	8 days
1.08.09	Provide cooling gas tapping for methanator	1 day
1.08.10	Install flow meters on BFW make up line	1 day
1.08.11	107 JT ring pressure tapping	2 hrs.
1.08.12	Provide 3" pass for FRC 2 on steam line for primary reformer	1 day

Job No.	Description	Time
1.08.13	Provide additional high level alarm on 129 JC & 130 JC	2 days
1.08.14	Provide manhole on 112 C	3 days
1.08.15	Cooling gas connection from 101D/102D to fuel line	1 day
1.09.01	Inspection of refractory of 101 B	X
1.09.02	- do - 101 E absorber	X
1.09.03	- do - 102 E A/EB	X
1.09.04	- do - 104 E	X
1.09.05	- do - 102 F	X
1.09.06	- do - 103 F	X
1.09.07	- do - 103 D	X
1.09.08	- do - 105 D	X
1.09.09	- do - HTS 104-D	X
1.09.10	- do - Heat exchangers	X
1.09.11	- do - 106 F for catalyst dust & oil sludge	X
1.09.12	Pipe line thickness survey	X
1.10.01	Instrument Maintenance Jobs	15 days
1.10.02	Vibration probes installation on 101 J, 105 J, 103 J	18 days
1.11.01	66 KV Switch yard maintenance	3 days
1.11.02	MPSS maintenance of KV 11 panels	3 days
1.11.03	MCC 5 maintenance	2 days
1.11.04	General maintenance - electrical	- -
1.11.05	Ammonia plant 22 motors over hauling	14 days

AMMONIA PLANT ACTIVITIES

Ammonia Plant

Job No.	Activity No	Job Description	Time Reqd in Hours
1.01.01		Replacement of damaged blocks of Primary Reformer 101 B (45Nos.approx)	10 days
	01	Open furnace manhole covers	2 hrs.
	02	Prepare scaffolding inside the reformer in radiantzone	72 hrs.
	03	Remove Naptha & Steam piping connection to burner	44 hrs.@
	04	Remove burner gun assembly	22 hrs.@
	05	Remove old burner block	88 hrs.@
	06	Install new burner block	88 hrs.@
	07	Install burner gun assembly	22 hrs.@
	08	Install piping of steam and Naphtha	44 hrs.@
	09	Remove scaffolding (after completing all furnace Jobs)	

Parallel activities replacement @ 5 per day

Material Requirement

1.	Nuts size ½"		
2.	Tirfor Pull lift (½ ton)	4	Nos
3.	Babmoos 3" dia	100	Nos
4.	Planks	50	Nos
5.	Coir rope ½" dia	4	Nos.
6.	Burner gaskets	100	Nos.
7.	Burner blocks	45	Nos.

Job No	Activity No	Job - Description	Time Reqd in Hours
1.01.02		Replacement of bottom header insulation in 101 B (all eight headers	8 days
	01	Remove existing insulation	4 da
	02	Clean & inspect bottom header	8 hrs @
	03	Install ceramic blocks	10 hrs @
	04	Install inconel sheet container & strap	10 hrs @
1.01.02		Refractory repair & Cerafelt filling infurance & convection lone as required	5 d
		Material Requirement	
		1. Inconal sheet cut in required form & quantity	
		2. Inconel wire & strip	
		3. Ceramic moulded block-MK 1.1	
		4. Ceramic moulded block-M 1.2	
		5. Bricks	
		6. Cerafelt	
		7. Castable refractories	
		8. Mortar	
		9. Repair refractory in Section as per Inspection Report - March 1979.	
1.01.04		Primary reformer catalyst replacement	15 da
	01	Note down spring readings of tube supports	1 ho
	02	Oxidation	20 hr
	03	Cooling and furnace entry	20 hr
	04	Blinding and opening	12 hr
	05	Unloading of catalyst	72 hr
	06	Catalyst cleaning & inspection	36 hr
	07	Catalyst loading	200 hrs

Job No.	Activity	Job Description	Time Reqd in Hours
		Material Requirement	
		1. Catalyst	
		2. Flange gaskets	
		3. Studs	
		4. Hose	
		Special Tools and tackles	
		1. Crane (Coles)	
		2. Forklift	
		3. Boroscope telescope	
		4. PVC socks	
		5. Nylon rope	
1.01.05		Inspection of Reformer Tubes by MFL	4 days
1.01.06		Inspection of reformer tubes by inspection section	10 days
	01.	50% of field wells of riser tubes to be radiographed	5 days (approx)
	02.	Dye penetrant test of catalyst & riser tube weld joints	6 days (approx)
	03	Creep measurement of catalyst tubes & riser tubes	6 "
	04.	Ferrite measurement	4 "
		Materail Requirement	
		1. Radiography films	
		2. Dye penetrant chemicals	
1.01.07		Provide additional naphtha valve for arch burners	

Job No.	Activity No.	Job Description	Time Reqd in Hours
		Material Requirement	
		1. Naphtha valves 126 Nos	
		2. Welding rods	
		3. Welding and cutting set one each	
1.01.08		Inspect the spring support for loose bolts & nuts and repair it.	1 day
1.01.09		Rectification of defective valve in reformer 101 B	4 days
	01	Secondary airs resistor of many burners are not aperable to be easened	
	02	Naphtha plex strainer change over valve is stock upto be easened	
1.01.10		I.D. Fan rotor replacement	11 days
	01	Uncouple fan and gear box	
	02	Open casing bolts	
	03	Open bearing top halves	
	04	Remove cone bolts	
	05	Remove front casing	
	06	Remove rotor	
	07	Install new rotor	
	08	Box up.	
		Material Requirement	
		1. Casing bolts	
		2. Rotor	
		Special tools & tackles	
		1. H.M. Crane	
		2. Coles Crane	

Job No.	Activity No	Job Description	Time Reqd. in Hours
1.01.11		[illegible] for uprating	5 days
	01	Uncouple turbine & gear box	
	02	Open bearing top halves	
	03	Remove governor	
	04	Remove bolts of turbine	
	05	Remove rotor	
	06	Remove nozzles & reversing buckets	
	07	Install new nozzles & new reversing buckets	
	08	Put back turbine rotor	
	09	Put back top casing & check carbon ring clearance	
	10	Box up both the bearings	
	11.	Put back the bearings	
	12	Check aligrment	
1.01.12		I.D. Fan Preventive Maintenance	5 days
	01	Open fan bearings & check the clearance, than box up	8 hrs
	02	Replace coupling between fan & gear box	10 hrs.
	03	Open gear box & check bearings & gears. Replace bearings if required	12 hrs.
	04	Overhaul the turbine	30 hrs.
	05	Check aligrment between turbine and gear box, gear box and fan	24 hrs
	06	Painting of I.D. fan casing/duct	24 hrs.
	07	Provide isolation valves & bypass valve for lube oil-filter & clean oil cooler	8 hrs.

Material Requirement

1. 1" valves Gate S.W. 3 Nos.
2. Coupling between fan & box

Tools & Tackles

1. 2 ton chain pulley blocks

Job No.	Activity No	Job Description	Time Reqd. in Hours
1.01.13		Transfer line - 107 D	
		S.S. lining to be replaced inspect refractory lining & repair	1 day
		Material Requirement	
		1. Gasket 1 No.	
		2. Refractory	
		3. 1 ton chain pulley block 1 No.	
1.01.14		L.T. Superheather coil support to be strangthered	
1.02.01		Secondary Reformer catalyst changing & air burner replacement	142 days
	01	Oxidation	20 hrs.
	02	Cooling of catalyst	116 hrs.
	03	Open main top flange & bottom plug	6 hrs.
	04	Lift the air burner & cover & send it to workshop	6 hrs.
	05	Unloading of catalyst	120 hrs.
	06	Catalyst loading	72 hrs.
	07	Put back cover & bottom plug	6 hrs.
	08	Cutting of weld joint to remove existing air burner	18 hrs.
	09	Welding of new air mixer	
	10	Shift air mixer cover to site	
	11.	Box up	24 hrs
		(8,9,10 can be done parallel)	
		Material Requirement	
		1. New air burner	
		2. Top & bottom flange gasket	
		3. Catalyst	

Job No.	Activity No	Job Description	Time Reqd. in Hours
		Tools & Tackles Requirement	
		1. Electrical hoist	
		2. Chain block 5 ton capacity	
1.03.01		H.T. Shift Converter 104 D catalyst replacement checked with chart	8¼ days
	01	R.F. Oxidation	20 hrs
	02	Cooling of R.F.& blinding of HT	32 hrs.
	03	Water filling & cooling	24 hrs.
	04	Unloading rasching ring, screens & catalyst	48 hrs.
	05	Cleaning & marking	12 hrs.
	06	Loading of catalyst	36 hrs.
	07	Screen fixing rasching ring and boxing up	24 hrs.
		Material Requirement	
		1. Catalyst	
		2. S.S.Screen & S.S Bolts & nuts if necessary	
1.03.02		SP 71-isolation valve & control valve not holding	3½ days
	01	Remove both the valves & bring them down	8 hrs.
	02	Open the valves & check them thoroughly	12 hrs.
	03	Lap the valve seat & gets upto the requirement	30 hrs.
	04	Test both the valves	30 hrs.
1.03.03		Drain valve of LTS outlet bypass valve is passing	2 hrs.
1.04.01		Boiler Inspection	12 days
	01	Open water side main flange joint	42 hrs.
	02	Open feed water inlet & outlet joints	24 hrs.

Job No.	Activity No	Job Description	Time Reqd. in Hours
	03	Lift the bundle & repair the joints	48 hrs.
	04	[illegible] flange joint & water inlet & outlet joints	96 hrs.
	05	Provide blinds for testing (11 Nos.)	48 hrs.
	06	Open steam drum 101F for inspection cleaning & box up	24 hrs.
	07	Repair superheater steam vent valve	48 hrs.
	08	Clean auxiliaty boiler tubes	72 hrs.
	09	Repair the auxilary boiler blowdown which are not holding and also repair 123-C BFW line inlet drain	24 hrs.
	10	Pressurise complete system at 125Kg/Cm^2	18 hrs.
	11.	Blind and test 112 C Boile	48 hrs.
	12	Offer the boiler to CIB	24 hrs.
	13	Remove all blinds	48 hrs.
1.04.02		Steam leakages & vslves repair	13 days
	01	111-J discharge block valve are not holding replace	12 hrs.
	02	101 JT 105JT steam inlet valves are hard to operate	12 hrs.
	03	FRC - 2 be elevated	16 hrs.
	04	103 JBT, 103JAT/TTV is passing and TTV.D/S drain valve line flange is leaking	4 hrs.
	05	Gland leak of feed preheater coil purging steam valve	1 hr.
	06	104 JT TTV gland leak	8 hrs.
	07	V-7 steam header drain valve is passing badly	16 hrs.
	08	101 JT U/s drain valve/bonnet is leaking	12 hrs.
	09	103 JBT drain valve is passing	8 hrs.
	10	105 C/B gas outlet flange is leaking	-
	11.	Gland leak of isolation valve of 103-JAT	2 hrs.
	12	101 BJT TTV 1st drain valve gland is leaking & box is to be removed	16 hrs.
	13	104 JT/JAT steam inlet block bypass valve repair/replacement	8 hrs.
	14	103 JAT exhaust isolation valve & its bypass are passing badly	12 hrs.
	15	107 JAT replace the bypass valve on V-7 on steam line	
	16	104 JT/JAT steam admission governor valve D/S flange near turbine is leaking	40 hrs.

Job	Activity	Job Description	Time Reqd.
	17	Provide second isolation valves on snuffing steam to vent silencers. Locate the valve nearer to main header	12 hrs.
	18	The drain valves & bypass block valve are to be replaced around steam let down station	30 hrs.
	19	H.S header drain valves are to be repaired/ replaced	20 hrs.
	20	3.5 kg steam valve to 111 C.A/B is stuck to be replaced	4 hrs.
	21	Repair 104 J/JT discharge block valve & inspect check	24 hrs.
	22	Bonnet leak of check valve on purging steam to SP-73 (102.B A/B) silencer FRC-4 Platform	6 hrs.
	23	Remove box from the D/S block valve on to NG feed pre heat coil	6 hrs.
	24	Provide a new valve of straner drainer valves at 103 JAT straner drainer valves and gland are leaking	

Material Requirement

1.	1½" 800 lbs rating SW.gate valve	1	No
2.	¾" 800 lbs S.W gate valve C.S	2+1 2+9	No
3.	1" 800 #threaded gate valve	C.S. 3+4+2	
4.	2" 800 # S.W gate valve C.S.	1+3	Nos
5.	¾" 800 # lbs threaded gate valve	1+1	
6.	½" 800 # S.W. gate valve C.S.	1	
7.	1" 800 # S.W. gate valve C.S	1	
8.	¾" 1500 # S.W. gate valve C.S.	6+9	

1.04.03		127-C A/B Chemical cleaning of refrigerent condenser (127-C A/B)	100 hrs.
	01	Provide blind at C.W inlet	20 hrs.
	02	Cut C.W return line and provide additional flange joint. This is to facilitate gap for inserting blind at outlet.	48 hrs.
	03.	Cut and provide 6" flange connections it end covers.	16 hrs.

S. No.	Activity No	Job Description	Time Reqd.
	04	Connect chemical cleaning piping	8 hrs.
	05	Start circulation	12 hrs.
	06	Water flushing	16 hrs.
	07	Stop and remove connections and remove blinds also	16 hrs.
		Material Requirement	
		1. 6" 150 # SORF C.S.Flanges - 2 Nos	
		2. 6" 750 # SORF C.S. - 4 Nos	
		3. 6" 750 # Blind CS Flanges - 4 Nos	
		4. Chemical cleaning pump tank & hoses	
		Special Tools	
		1. H.M. Crane	
1.04.04		101 JC Surface condenser Chemccal Cleaning (Tube side)	110 hrs
	01	Provide 30" flange jointnon CW inlet line to facilitate blind provision and put the blind	48 hrs.
	02	Provide 30" flange joint on C.W.return line.(This is to facilitate gap for blind insertion) and put blind	48 hrs.
	03	Remove small covers & provide nozzles for chemical cleaning connection	8 hrs.
	04	Connect the chemical cleaning system to 101 JC	10 hrs.
	05	Start chemical circulation	12 hrs.
	06	Flushing with water	16 hrs
	07	Stop circulation remove connection and provide small covers in place	10 hrs.
	08	Remove blinds from C.W inlet & outlet	24 hrs.

Job Activity		Job Description	Time Regd.
		Material Requirement	
		1. 6" 150 # flanges - 4 Nos	
		2. Chemical cleaning system	
		Special Tools & Tackles	
		1. Cloos Crane	
1.04.05		Chemical Cleaning of MEA Solution cdntres - 108 Cs Bottom coolers (Tube side)	102 hrs
	01	Remove C.W. return pipe & provide 16" 150 NB x 6" nozzle connection	16 hrs
	02	Provide blinds at CW inlet joints	8 hrs.
	03	Provide 6" nozzle connection in bottom covers of 108 CS	10 hrs.
	04	Connect the chemical cleaning system to 108 CS	6 hrs.
	05	Start chemical circulation	12 hrs.
	06	Start flushing	16 hrs.
	07	Stop flushing and remove connection	6 hrs.
	08	Remove blinds and install C.W. return pipe	16 hrs.
		Material Requirement	
		1. 16" 150 # SORF C.S. Flanges - 2 Nos.	
		2. 6" 150 # SORF C.S. Flanges - 4 Nos.	
		3. Chemical cleaning system	
		Special Tools & Tackles	
		1. Coles Crane	
1.04.06	C	Chemical Cleaning of Lube Oil Coolers 101 j/105J and 103 J.	

Job No.	Activity No.	Job Description	Time Reqd. in Hours.
	01	Remove CW Inlet and Outlet pipe connections	10 hrs.
	02	Connect the nozzles for chemical cleaning (6" x ¾ & 4") two nos each.	6 hrs.
03	03	Connect chemical cleaning system to oil coolers	12 hrs.
	04	Start circulation	12 hrs.
	05	Water circulation	8 hrs.
	06	Stop circulation & remove connection	12 hrs.
	07	Connect CW inlet & outlet pipe	
1.04.07		Sonthesis Gas compressor inter stage cooler - 116 C Cleaning	110 jrs.
	01	Open gas inlet and outlet piping joint	8 hrs.
	02	Open channel cover bolts	20 hrs.
	03	Remove channel cover	2 hrs.
	04	Pull out tube bundle	8 hrs.
	05	Clean the tube bundle	24 hrs.
	06	Insert the tube bundle into shell	16 hrs.
	07	Put back channel cover & tighten the bolts	24 hrs.
	08	Connect gas inlet & outlet joints	8 hrs.

Material Requirement

1. Channel cover gasket
2. Wooden sleepers

Special Tools & Tackles

1. Crane (Cdes)
2. Fork Lift
3. Chain pulley block 5 ton capacity 1 No.

Job No.	Activity No.	Job Description	Time Req. in Hours.
1.04.08		Refrigerent compressor water cooler - 128-C Cleaning	38 hrs.
	01	Open both end cover	6 hrs.
	02	Tube side cleaning	24 hrs.
	03	Box up both end covers	8 hrs.
		Material Requirement	
		1. End cover gaskets	
		Special Tools & Tackles	
		1. H.M. Crane	
		2. Nylon Bushes	
1.04.09		Air compressor inlet stage coolers-129 JC & 130 JC-Cleaning tube side	98 hrs.
	01	Remove C.W.inlet & outlet pipe from both coolers	20 hrs.
	02	Open end covers of both coolers	12 hrs.
	03.	Clean the tubes	30 hrs.
	04.	Box up both covers	16 hrs.
	05	Box up C.W. inlet & outlet pipes	20 hrs.
		Material Requirement	
		1. Cover gaskets	
		Special Tools & Tackles	
		1. Chain pulley block 1 ton capacity 2 Nos.	

Job No.	Activity No.	Job Description	Time Reqd. in Hours
[illegible]		[illegible]	[illegible]
	01	Open air inlet & outlet connection	6 hrs
	02	Open both end covers	8 hrs.
	03	Tie chennel farme to push out the bundle	4 hrs.
	04	Pull out the bundle	6 hrs.
	05	Clean the bundle	24 hrs.
	06	Push in the tube bundle	10 hrs.
	07	Box up both end covers & air inlet& outlet joints	16 hrs.

Material Requirement

1. Cover gaskets
2. Sleepers
3. Chain block 5 ton capacity -1 No.

1.04.11		Cleaning of gland condenser of 101J, 105L & 103 J	32 hrs
	01	Open end covers of condensers	10 hr s.
	02	Clean tube side	12 hrs.
	03.	Box up end covers	10 hrs.

Material Requir-ement

1. Cove-r gasket
2. Nylon brush

1.04.12		Replacement of ME.. Solution centre-108 C Top absorber west side tube bundle	3 days.
	01	Remove floating head	6 hrs.
	02	Remove channel cover	4 hrs.

Job No.	Activity	Job Description	Time Reqd in HRS
1.04.12	03	Remove C.W.outlet MEA inlet & outlet pipe joints.	6 hours
	04	Bring down the cooler and place it near stripper	3 hours
	05	Install channel from for pulling out tube bundle	3 hours
	06	Pull out tube bundle & put it a side	8 hours
	07	Put new tube bundle in position to insert it into the shell	4 hours
	08	Insert the bundle into the shell	20 hours
	09	Life the cooler & place it in position	6 hours
	10	Box up floating head cover & bend	8 hours
	11	Box up channel cover	6 hours
	12	Box up MEA inlet & outlet and C.W. outlet pipe.	4 hours

Material

1. Tube bundle
2. Cover gaskets
3. Sleepers

Special Tools & Tackles

1. H.M.Crana
2. Forkl lift
3. Chain pully block 5 ton capacity 2 Nos.

1.04.13 Replecement of Synthesis Gas compressor after cooler 124 C Tube bundle. 134 hours

(By M/s.& nup Engineering, Ahmedabad)

Job No.	Activity No.	Job description	Time Reqd in HRS
1.04.14		Replace steam coil of vacunm flasher with S.S. tubes.	1 day
		Material :	
		Tube bundle	
1.04.15		Cleaning of - 115 C	
1.05.01		SYN. CONVARTER 103-D, Catalyst Charge	10 Days.
	01	Shutdown back and (put 103- J on kick backs)	2 hours
	02	Cooling of converter with syn.Gas	8 hours
	03	Step 103 -J depressurise loaps	4 hours
	04	Cooling water M.T.N.outlet gas at pressures	8 hours
	05	Purging with inert gas	8 hours
	06	Blinding	16 hours
	07	Removal of bottom shell cover	12 hours

Ammonia Plant.

Job.	Activity		Man hours
1.05.01	08	Preparation for dry catalyst dump out	12 hours
	09	Dry unloading	72 hours
	10	Preparation for wet unloading for quenching and filling	24 hours
	11	Opening of converter shell and gasket man holes and purge with air	12 hours
	12	Wet unloading	24 hours
	13	Washing, Cleaning and drying	12 hours
	14	Inspection	12 hours
	15	Boxing up bottom drop out flenge	8 hours
	16.	Charging aluminum balls	12 hours
	17	Catalyst loading	120 hours
	18	Boxing up	24 hours
	19	Blind removal	16 hours
	20	Purging	30 hours

Material Requirement

1. Catalyst
2. Crane/Hoist
3. Hopper/chute
4. Conveyor
5. Truck

...

	PM of Air compressor Drive Turbine - 101 JT Turbine	30 hours
01	Open journal & thrust bearings	10 hours
02	Inspect check & measure clearnces	10 hours

Job No.	Activity	Job description	Time Reqd in HRS.
1.06.01			
	03	Remove coupling & clean it	4 hours
	04	Check clearance between OST pin & Knob.	2 hours
	05	Loose the trip throttle valve & provide missing handles.	4 hours
	06	Box up bearings when instrument jobs are over.	10 hours
1.06.02		P.M. of Air compressor -101- J LP stage	100 hours
	01	Disconnect lube oil piping & take out instruments.	4 hours
	02	Open bearing & inspect them	6 hours
	03	Remove coupling between LP & gear box	3 hours
	04	Open casing bolts	20 hours
	05	Lift top cover	4 hours
	06	Inspect labyrinths & measure the clearances	6 hours
	07	Take out rotor & inspect it	2 hours
	08	Clean top and bottom half casing clean rotor also	6 hours
	09	Replace worn out labyrinths	8 hours
	10	Put back rotor	2 hours
	11	Measure labyrinth clearances	6 hours
	12	Put back casing top half	6 hours
	13.	Tighten the casing bolts	20 hours
	14.	Measure journal & thrust bearing clearance	8 hours
	15.	Box up bearings after the instrument jobs are over	10 hours
	16	Clean couplings	2 hours.

Job No.	Activity	Job description	Time Reqd in Hrs.
1.06.03	.	P.M.of Air compressor -101-J H.P.stage.	120 hours.
	01	Remove discharge pipings	6 hours.
	02	Disconnect lube oil piping & take out instruments.	4 hours.
	03	Open bearing & inspect them	6 hours.
	04	Remove coupling between gear box & HP case.	3 hours.
	05	Open casing bolts.	20 hours.
	06	Lift top cover	4 hours
	07	Inspect labyrinths & measure the clearances.	6 hours.
	08	Take out rotor & inspect it	2 hours
	09	Clean top & bottom half casing Clean rotor also.	6 hours.
	10.	Replace worn out labyrinths	8 hours
	11	Measure labyrinth clearances	6 hours
	12	Put back casing top half	6 hours
	13	Tighten the casing bolts	20 hours
	14	Measure journal and thrust bearing clearances.	
	15	Box up bearings-after inst. jobs are over	10 hours
	16	Box up discharge piping.	8 hours
	17	Connect oil piping	4 hours
	18	Open gear box cover	3 hours
	19	Check be-arings & clearances	8 hours
	20	Box up the cover after inst. jobs are over	3 hours

Job No.	Activity	Job Description	Time Required
1.06.04		PM of Ammonia Refrigeration compresoor Drive Turbine 105-JT overthauling.	137 Hours.
	01	Open steam outlet and inlet and inlet piping	8 hours.
	02	Remove inlet & outlet piping & remove expansion joint also	6 hours.
	03	Remove oil connections & instrument	4 hours
	04	Remove governor & coupling.	6 hours
	05	Open bearing covers & inspect the pads/ shoes	6 hours
	06	Open casing holts	20 hours.
	07	Lift top half of casing	6 hours
	08	Inspectiotor & meassure labyrinth cleances	6 hours
	09	Clean and inspect the rotor-for deposits	8 hours
	10	Replace any wornout labyrinth if required	6 hours
	11	Clean both casing halves	4 hours
	12	Put back top casing	4 hours
	13	Tighten the casing bolts	20 hours
	14	Assemble the bearing with new pads if required (Record bearing clearances only after inst. jobs are over)	10 hours
	15	Assemble the governor	6 hours
	16	Connect oil piping	4 hours
	17	Connect steam inlet & outlet piping & expansion joint	12 hours
	18	Check clearance between OST pin & turbine & governor servo piston stroke	4 hours
	19	Clean the coupling	2 hours
	20	Remove nozzle valve assembly	8 hours
	21	Search for the missing nut	4 hours

Sr.No.	Activity	Job Description	Time Regd in Hrs.
1.06.04		PM of ... ... Overhauling	10 hours
	23	Base the T.T.V. of turbine	3 hours
1.06.05		105 LP and HP bearings are to be opened	112 hours
	02	Remove coupling hubs with hydraulic pressure (only 3 hubs).	16 hours
	01	Remove couplings and oil piping	8 hours
	03	Remove bearing with housing one by one only in one mechine	6 hours
	04	Check and inspect bearings	2 hours
	05	Clean coupling	6 hours
	06	Box up bearing after inst. job is over	12 hours
	07	Install couplinghub with hydraulic pressur pump.	20 hours
	08	Assemble coupling and connect lube oil piping	16 hours.
	09	Open gear box cover for proble installation	3 hours
	10	Check the bearings & bearing cleanrances	8 hours
	11	Box up cover after inst jobs are over	3 hours
	12	Open & check the governor of 101J/105J lub oil turbine	6 hours
	13	Uncouple the turbine and L.O.pump. Remove old grease from coupling & put new grease & couple the pump.	
1.06.06		PM of synthesis rar compressor & turbine 103 -J-T rain	146 hours
	01	Open both turbines bearings & couplings in between	8 hours
	02	Open coupling between 103 JAT & 103 LP and between 103 J LP	8 hours
	03	Open bearing of 103 J LP & 103-JHP (4 bearing) @ 6hrs	24 hours.
	04	Check nozzle valve closing spring length & check somi piston stroke if necessary adjust	8 hours
	05	Clean all three couplings	12 hours
	06	Check relay trip valve & LP trip valve as given oil pressure remains low	12 hours

... IBT gland

Job No.	Activity	Job Description	Time Reqd in Hrs.
0.06.06	08	103 J HP case balance line flange [illegible]	[illegible]
	09	Rectify the oil leak from 103 JAT oil guard on out board side.	3 hours
	10	Replace oil guard	2 hours
	11	Check the governor of seal oip pump turbine, Replace the bearing oil sttend turbine side seal & check alignment	8 hours
	12	103 JBT -IIV leking lever to be adjusted	2 hours
	13	Assemble bearings after instrument job are over.	32 hours
	14	Couple the complete 103 J train	24 hours
1.06.07		MEA Circulation pump/Drain Turbine 107 JT (Murrey Turbine)	76 hours
	01	Open steem inlet & outlet joint	6 hours
	02	Remove expansion joint	4 hours
	03	Open casing belts & bearing top covers	6 hours
	04	Lift top casing half	4 hours
	05	Remove disphragm	6 hours
	06	Open governor valve & W.W. Governor	6 hours
	07	Remove roter	4 hours
	08	Check for any steam by pass inside casing	3 hours
	09	Replace end seal	2 hours
	10	Install the rotor	6 hours
	11	Put back disphragm and check labyrinth clearance	6 hours
	12	Put back top casing	6 hours
	13	Assemble bears. & governor and governor valve	8 hours

Job No.	Activity	Job Description	Time reqd in hours 72
1.06.07	14	Put back expansion joint & boxup steam inlet & outlet connection.	10 hours
1.06.08		Overhaul 104 J/JA and inspection of turbines	
1.06.09	01	preside hydroulic governor for coppus turbine	
1.07.01		Testing & Repair of relief valves	6 days.
	01	103 JAT Sendival relief valve to be repaired	16 hours.
	02	101 F RVS to float & steam header	24 hours.
	03	Overhauling of superheater coil relief RV 101 B	16 hours
	04	38 kg relief valve RV HS 8 overhauling	16 nours
	05	108 J discharge relief valve to be repaired	10 hours
	06	RV 171-C-T relief valve passing	8 hours
	07	RV 112-C 1 and 2 to be repaired	16 hours
1.07.02		Pipe line fabrication	6 days
	01	Replace 110 C A&B outlet pipe with SS pipe partly (Contract)	72 hours
	02	106 J suction & discharge lines to be replaced with SS (Contract)	120 hours
	03	Change following Co_2 lines as per inspection report dated 27.1.79.	
		i Co-1A-18"). Exit from stripper A/3 ii Co-1B-18"). iii Co-3A-18" inlet to 110 C/A	
	04	Replace the 4" line to 6" from 112 J/JA discharge upto up stream LC 2	96 hours

Job No.	Activity	Job Description	Time reqd in HRS.
1.07.02			
	05	Connection for amine gaurd injection to Co2 stripper exit lines	(Contract)
	06	Replace the patched steam inlet line to MEA	
1.07.03		Miscellaneous fabrication & repair jobs	6 days
	01	105 CB tube outlet elbow weep hole is leaking. Also the tube outlet joint is leaking above tube sheet. Also check for leaks while shutting down in 105 C s and 11 -Cs.	28 hours.
	02	107-JT steam inlet valve passing	16 hours
	03	CO2 absorber rich/solution outlet valve and CO2 strippers lean schution valve not holding.	30 hours
	04	Drains of 117-C, & 119 C are choked	4 hours
	05	V-25 globe valve is passing to be repaired	10 hours
	06	Quench valves on 105 J kick backs are hard to opera to	6 hours
	07	121 J/JA discharge valves are hard to operate	4 hours
	08	Remove pluge from weepholles from sya convertor shall and provide	24 hours
	09	109 C/B Rich MEA inlet exchanger side nozzel box is to be repaired	8 hours
	10	101 -E gas inlet block valve is hard to operate	20 hours
	11	Provide and flange on MEA inlet to reboilers 111-C A/B and 105/C A/B MEA 33-A-16" and MEA 33-B-16"	(Contract)
	12	Remove box from 102-C wet bottom rich MEA nozzel	4 hours

Job No.	Activity	Job Description	Time reqd
1.07.03			
	13	123-C outlet conductivity meter topping PO valve bonnet is leaking badly	4 hours
	14	Inspect test coupons installed last turnaround in MLA system & install new one	4 hours
	15	108-C cooling water outlet butterfly to be repaired	4 hours
	16	Inspect check valve 107-J/JA	8 hours
	17	123- J discharge valve are passing	24 hours
1.08.01		Terry turbine installation & erection for BFW Pump	14 days
	01	Remove existing turbine completely	24 hours
	02	Modify foundation for terry turbine	72 hours
	03	Erect terry turbine on foundation & level it	72 hours
	04	Align the turbine with pump	48 hours
	05	Modify & connect steam inlet piping to suit the turbine	48 hours
	06	Install butterfly valve expension joint line	32 hours
	07	Erect lub oil console & system	48 hours
	08	Provide connection with surface condesor	32 hours
	09	24" pipeline instalation & connection	96 hours
	10	Testing 11 Nos.	40 hours

Material

1. Turbine and auxiliaries
2. 24" Ø pipe
3. 6" Ø pipe & bend
4. 1" valve 800 lb. - 5 Nos.

Job No.	Activity	Job Description	Time reqd in HRS
1.08.01		Tools M	
		Crane	
1.08.02		Replacement of auxiliary boiler burners	13 days
	01	Dismatling of old burners, connecting piping & removal of existing burners	1 day
	02	Modification in refractory work for new burners	2 days
	03	Installation of new burner/and repair of refractory	1 day
	04	Taking tapping for Naphtha steam & B.F.W ter.	3 days
	05	Connecting naphtha steam lines to burners	1 day
	06	Hydro test	1 day
	07	Instrumentation work	4 days
	08	Fabrication & erection of Naphtha steam BFW lines & inter connecting control valve etc (pre shutdown)	4 Weeks

Material

1.	Pipes	SS65	Ø	100 mtr
		SS 15	Ø	30 mtr
		CS100	Ø	60 mtr
		CS 80	Ø	54 mtr
		CS 25	Ø	100 mtr
		CS 15	Ø	42 mtr
		SS 25		
2.	Flanges	SS Orifice		65 Ø 2 mtr
				65 Ø 8 mtr
				80 Ø 2 mtr
3.	Flanges	S.S.		25 Ø 24"

Job No.	Activity	Job Description	Time Reqd in Hours
1.08.02		4. Fittings C.S.elbowe 100 sch. 40 80 sch. 40	
		5. Cap-100 Ø	
		C.S.Tee-100 S.40, 25 S.160 15 S.80, 25 S.160	
		S.S.Tee-15 S40, Reducer-25 x 15 S80	
		S.S.elbows 25 S160,25 S80m 15 S160	
		S.S.Elbows -15 Ø S40	
		S.S.Weldolets 65 x 15	
		C.S.Weldolets 100 x 25, 200x25, 25x15	
		6. S.S.Tee 80 x 80 x 65 S40 SS cap 65 Ø S.S. Tee 65 x 65 x 65 S40	
		7. S.S.elvows 65 Ø	
		8. CS 100 Ø, 80 Ø, 25 Ø valves 1+2+7	
		9. CS 25 Ø & 15-1500 lbs valves 5+2	
		10. CS 40, 15 Ø-800 lbs valves 7	
		11 SS 80, 65, 40 &25 Ø-valves 1+1+7	
		12 Cooper tubes	
		13 SS Tubes	
		14 Elect cables 4 x 1.5 mm^2	
		15 Compression fittings	
		Tools	
		1. Crane & scaffolding	
1.08.03		Strengthening of ID fan foundation (Contract job)	10 days.

Job No.	Activity	Job Description	Time Reqd in hours
1.08.04		Amine guard tapping for CO2 lines of exit of strippers	1 days.
		Material	
		1. ¼" Ø SS Pipe	
1.08.05		Relocate N.G.Separator near CMS to clear area near PGR plant	4 days
1.08.06	M	Provide trppings for PGR plant	6 days
	01	Feed gas tapping 50 NH	
	02	Hydrogen gas tapping 80 NB	
	03	Tail gas tapping 200 NB	
	04	Cooling water supply 100 NB tapping	
	05	Cooling water return 100 N.B. Tapping.	
	06	Steam line 50 NB tapping	
	07	Inert gas tapping 25 NB tapping	
	08	D.M.Water tapping 25 NB tapping	
	09	Instrument air tapping 25 NB tapping	
1.08.07		Modify SP 73 by extending it to 10'	8 days
1.08.08		Provide control valve on steam line to air coil	8 days.
		Material	
		1. 3" N.B.600 control valve	
		2. Dolts, Nuts and gasket for C.valve.	
1.08.09		Provide cooling gas tapping for methantor	1 day
1.08.010		Floweter on BFW make up line	1 day
		Material	
		1. 6" Ø Aluminium orifice flanges 2 Nos.	

Job No.	Activity	Job Description	Time Reqd
1.08.04		Amine guard tapping for CO2 lines of exit of strippers	1 days.
		Material	
		1. ¼" Ø SS Pipe	
1.08.05		Relocate N.G.Separator near C-13 to clear area near PGR plant	4 days
1.08.06	M	Provide tappings for PGR plant	3 days
	01	Feed gas tapping 50 NB	
	02	Hydrogen gas tapping 80 NB	
	03	Tail gas tapping 200 NB	
	04	Cooling water supply 100 NB tapping	
	05	Cooling water return 100 N.B. Tapping.	
	06	Steam line 50 NB tapping	
	07	Inert gas tapping 25 NB tapping	
	08	D.M.Water tapping 25 NB tapping	
	09	Instrument air tapping 25 NB tapping	
1.08.07		Modify SP 73 by extending it to 10'	8 days
1.08.08		Provide control valve on steam line to air coil	8 days.
		Material	
		1. 3" N.B.600 control valve	
		2. Bolts, Nuts and gasket for C.valve.	
1.08.09		Provide cooling gas tapping for methantor	1 day
1.08.010		Floweter on BFW make up line	1 day
		Material	
		1. 6" Ø Aluminium orifice flanges 2 Nos.	

Job No.	Activity	Job Description	Time Reqd in hours.
1.08.11		107 JT Ring press and tapping	2 hours
1.08.12		Provide 3" by pass for FRC-2 on steam for primary reformer	24 hours
		Material	
		3" pipe elbow, valve, NRV flanges reducer weldolet	
1.08.13		Provide additional high level alarm on 129 JC/130JC	2 days.
1.08.14		Provide manhole on Low temperature shift connertor exchanger-112-C	4 days.
1.08.14	01	Fabrication of manhole cover (per shutdown)	1 days.
	02	Cutting holes for manholes	1 days
	03	Strangthering of manhole as per drawing	1 day
	04	Install manhole cover	2 hours
	05	Attend the tube leak	1½ days
	06	Hydro test of vessel 112 C	1 day
1.08.15		Cooling gas connection from 101. D/ 102 D to fuel line	1 day

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INSPECTION

1.09.01	Inspection of Transfer lines from 103-D to 101 CV/CB
1.09.02	-do- CO2 absorber 101E
1.09.03	-do- CO2 stripper (103B)
1.09.04	-do- Condensate stripper 104E
1.09.05	-do- Raw gas separator 102 F
1.09.06	-do- CO2 flash out drum 103 F
1.09.07	-do- Secondary reformer 103 D
1.09.08	synthesis converter 105 D
1.09.09	shift converter 102 D
1.09.10	Heat Exchangers.
01	Visual inspection of tube bundles.
02	Radiography & stress relieving of welds for synthesis after cooler 124C.
1.09.11	Inspect 106 F for catalyst dust/ oil eludge.
1.09.12	Pipeline thickess survey of the following pipe line.

MEA -1-300 MEA -2-100 MEA-3-100
MEA-7-300 MEA-10AB-300 MEA-11-350
MEA-25-80 MEA-26AB-62.5/37 MEA-29AB-300
MEA-12AB-300 MEA-15AB-300 MEA-20-300
MEA-27AB-450

CO-1AB-450	CO-7-600	CO-15-750
PW-1-150	PW-4-62.5	PW-5-50
PW-8-37.5	PW-19-150/100	PW-20AB-150
PW-29AB-250	PW-31-300	PW-17-100
PG-3-450	PG-6-450	PG-10-450
PG-13-400	PG1715-350	PG-14-400
PG-10-300	PG-21-500	

SG-11-250	SG-12-350	SG-6-300
SG-13-300	SG-18-450	SG-22-300
SG-23-300	SG-33-350	SG-35-300
SG-42-100	SG-44-100	SG-34-350
SG-62AB-100		

Boiler blow down line bends
Steam let down station elbow
(PK 13 area)

INSTRUMENTATION- AMMONIA PLANT

Job No (1)	Activity (2)	(3)	(4) hours
1.10.01		Instrument maintenance job	
	01	All electronic recorders (temperature, vibration analyser & speed) Overhauling cleaning inspection and checking of calibration.	15 days
	02	All Taylor recording receivers, indicating receivers & set point transmitters overhauling inspection & checking of calibration.	10 days
	03	Taylor transducer controllers cleaning inspection and calibration checking	5 days
	04	Taylor E/P transducers overhauling, inspection & calibration checking	2 days
	05	Receiver pressure switches checking	3 days
	06	Receiver gauges clenning & calibration checking	3 days
	07	Control room air header air filter regulator overhauling and air header blowing	1 day
	08	Rectification of air header leakage in control room	1 day
	09	Field mounted controllers overhauling, cleaning & calibration checking other than level controllers	5 days
	10	Cleaning & calibration checking of D/P Cells	10 days
	11	Pressure transmitters calibration checking	1 day
	12	Preasure drop tranamitters calibration checking	) 1 day
	13	Level switches cleaning & checking	25 days
	14	Level controllers & transmitters cleaning & performance checking including calibration checking	4 days
	15	Inst. air header air filter regulators overhauling & indiwidual header flushing	6 days.
	16	Control valve positioners cleaning & stroking of control valves.	6 days.

(1)	(2)	(3)	(4)

17. Control valve plug & seat inspection — 5 days

i.	FRCa-1	ii.	FRCa-3
iii.	FRCa-3	iv.	FIC-12
v.	FIC-13	vi.	FIC-14
vii.	LC-13	viii.	LC-14
ix	V-16	x.	LC-23
xi.	FIC9,11,14	- Gland packing to be redone.	

18 FIC-13 hand jack assembly inspection — 12 hours

19 TRCa-10 control valve gland packing & sealing steam leaks to attend — 1 day

20. V-15 control valve diphragm inspection — 1 day

21. PRCa-3 transmitter impulse line first isolation valve gland leakage

22. TRCa-2 (VPI-2) mounting bracket welding — 1 day

23. PICa-13 A&B FICa-15, valve positioner cleaning & struking. — 2 days.

24. Compressor trip system switches safety system inspection — 2 days

25. Solencid valves on compressor trip system inspection — 2 days.

26 Solenoid valves on compressor trip system inspection — 2 days

27 Oil pressure control valves diaphragm inspection on 103-J and 105-J and 101-J Lube oil console.

28 PICa-13 A&B air header union leakage — 12 hours

29 PRCa-9 loading pressure gauge replacements — 12 hours

30 PRCa-12 & MRCa-23 overhauling inspection of internals. — 1 day

31 Angle support output line of PIa-79 & PIC-13 — 1 day

32 PDRa-35 LP impulse line plug leakage — 12 hours

33 PRCa-25 isolation valve gland leakage — 12 hours

34 TI-I-85, 118, 119, 120, Thermowell replacement — 1 day

35 LC-26 Inspection of 101 CA &CB level controller and modification — 2 days

36 D.M.Tank level indicator inspection & modification in installantion — 2 days

37 AI-8 conductivity meter near 123-C first isolation valve bonnet leakage

38 Instrument air dryer-Sieving & pur back the drying agent I make up level sorbids, check performance of henter & thermostat. — 1 day

(1)	(2)	(3)	(4)
	39	In compressor, check-up all speed pickup	[illegible]
	40	Check action of PB 3 and PB 6	
	41	PICa-13 transmitter drain valve replacement	12 hours
	42	PRCa-22 Baily positioner & damper overhauling & inspection	12 hours
	43	103-J location is to be shifted for HP & LP seal oil pr. switches for maintenance approach	2 days
	44	[illegible] kick backs are hard to operate to be repaired	6 hours
	45	New panel cutout for [illegible] M-E (110 annunciator) erection & commissioning of the annunciator	2 days
	46	The existing panel modifications suitable for erecting new panel for purge gas recovery system.	2 days
	47	106-D methanator power failure lock-out relay connections & panel cutout push button & indication lamp.	30 hours
	48	Hook up back up power (inverter) for instruments	6 days
	49	Steam to air-coil C/valve will be mounted in place of hand valve	1 day

<u>Material</u>

1.	C.T.C. 450 ml	50 bottles
2.	Cleanit	40 containers
3.	Naphtha	50 lts
4.	3 in one oil	50 nos of bottles 25 cc each
5.	grease stick (Aduco No. 731 6mm size)	50 pkts
6.	grease ordinary	50 kg.
7.	Silican grease	10 kg.
8.	Marking cloth	40 mts.
9.	Yellow Nepkin	100 Nos.
10.	I. Gland packing wire imp- -riganated graphite asbestos	2 no. rolls of 5 kg wt. for each size.

i. 4 mm
ii. 5 mm
iii. 6 mm
iv. 7 mm
v. 8 mm

II. Asbestos teflon gland packing in 4,5,6,7,8 mm size. — 1 roll of 5 kg for each item.

(1)	(2)	(3)	(4)
11.	Sorbits for marking up level in dryer chambers		75 kg.
12.	Sileve 1mm C/S size 2 mt x 1 mt		2 Nos.
13.	PVC coated copper tubing 1/4")D x 0.04" thickness		300 mt
14	S.S.tube1/4" O.D. x 1.2 mm thick		60 mt
15	S.S.tube 1/2" O.D. x 1.2mm thick		50 mts
16	3/8" O.D. x 1.2mm thick S.S.tube		50 mts
17	Cadmium coated brass & S.S.Compression fittings of 600 paig rating		
	1. Stud coupling 1/4"NPT (Male) x 1/4" OD tube with one nut & one ferrule (olive type)	)	
	ii. Straight coupling/union 1/4" OB tube x 1/4" OD tube with two nuts & two ferrule (olive type)	)	100 nos. each for SS & Brass.
	iii. 90° clbow 1/4" NPT (male) x 1/4" OD tube with one nut & one ferrule (olive type)	)	
	iv. 1/4" OD equel tee with 3 nuts & three ferrule (olive type)	)	
18	Needle valves S S		30 nos.
	i. 1/2" size x 6000 PSI rating		50 Nos.
	ii. 1/4" size x 8000 PSI rating		
19	1. 5mm SQ 660/1100V grade PVC insulated single stand copper wire		200 mtrs.
20	Rustalone		50 tins

Tools & Tackles

1.	Controller	1 No.
2.	Phnumatic calibrator	1 No.
3.	Deed act. tester	1 No.
4.	Merourry mino meter	2 Nos.
5.	Std. pressure gauges	2 Nos.
6.	Potentic moter	1 No.
7.	Multimeters	2 Nos.
8.	Digital multimeter	2 Nos.
9.	Vibrator	1 No.

1.10.02 Vibration monitoring panel new cutout & erection of monitoring panel. Electrical connections & connection of cables of the monitoring panel — 18 days.

BENTLEY NEVADA VIBRATION PROBE INSTALLATION

Job No.	List of activities	Duration
	VIBRATION PROBES INSTALLATION ON 101-J-H.P.CASE	
1.	Out beard journal bearing (O.B.J.D) cover opened.	½ hr
2.	Top half O.B.J.B. removed	1 hr
3.	J.B.brackets mounted	6 hrs
4.	Top half J.B.refixed	1 hr
5.	Probes fixed and calibrated (Point No.8)	2 hrs
6.	O.B.J.B. casing drilled for cable entry	2 hrs
7.	O.B.J.B. casing refixed	½ hr
7A.	End plate fixed and probes no.9 fixed and calibrated	1 hr
8.	I.B.J.B. cover removed	½ hr
9.	Top half I.B.J.B. removed	1 hr
10.	I.B.J.B. brackets mounted	6 hrs
11.	Top half I.B.J.B. refixed	1 hr
12.	Probes fixed and calibrated (Point No.7)	2 hrs
13.	I.B.J.B. cover drilled for cable entry	2 hrs
14.	I.B.J.B. casing refixed	½ hr
	VIBRATION PROBES INSTALLATION ON 101-J GEAR BOX	
15.	Gear box (G.B) cover opened	1 hr
16.	H.P.(N.E) shaft top half J.B. removed	1 hr
17.	J.B.Brackets mounted	6 hrs
18.	Top half J.B. refixed	1 hr
19.	Probes fixed and calibrated point no.6	2 hrs
20.	L.P. (N.E) shaft top half J.B. removed	1 hr
21.	J.B.brackets mounted	6 hrs
22.	Top half J.B.refixed	1 hr
23.	Probes (A1.A2) fixed and calibrated	2 hrs
24.	L.P.(SE) shaft top half J.B. removed	1 hr
25.	J.B.brackets mounted	6 hr
26	Top half J.B. refixed	1 hr
27.	Probes (Point No.5) fixed and calibrated	2 hrs
28.	H.P. (S.E) shaft top half J.B.removed	1 hr
29.	J.B. brackets mounted	6 hrs
30.	Top half J.B. refixed	1 hr

Job No.	List of activities	Duration
31.	Probes (Point No.B1. B2) fixed and calibrated	2 hrs
32.	Gear box cover drilled for bable entry and machined for end plate for probes (point No.D).	2 hrs
33.	H.P.gear (Key phasch notch drilled	2 hrs
34.	G.B.cover replaced	2 hrs
35.	End plates fixed probes (Point D) fixed and calibrated.	
36.	End plates fixed and probes (Point C) fixed and calibrated.	1 hr.
	VIBRATION PROBES INSTALLATION ON 101-J LP CASE	
38.	I.B.J.B. cover opened	½ hr
39.	I.B.J.B. top half opened	1 hr
40.	I.B.J.B. brackets fixed	6 hrs
41.	Top half I.B.J.B. refixed	1 hr
42.	Probes (Point No.4) fixed and calibrated	2 hrs
43.	I.B.J.B. cover cable entry drilled	2 hrs
44.	O.B.J.B. cover opened	½ hr
45.	Top half O.B.J.B. removed	1 hr
46.	O.B.J.B. brackets mounted.	6 hrs
47.	Top half O.B.J.B. refixed	1 hr
48.	Probes (Point No.3) fixed and calibrated	2 hrs
49.	Support articles removed	1 hr
50.	Brackets fixed on support articlos	6 hrs
51.	Suport article refixed	1 hr
52.	Probes Point No.E fixed and calibrated	2 hrs
53.	O.B.J.B. cover cable entry drilled	2 hrs
54.	I.B.J.B. cover replaced	½ hr
55.	D.B.J.B. cover replaced	½ hr
	VIBRATION PROBES INSTALLATION ON 101-JT TURBINS	
56.	I.B.J.B. cover removed	½ hr
57.	Top half I.B.J.B. removed	1 hr
58.	I.B.J.B. barckets mounted	6 hrs
59.	Top half I.B.J.B. refixed	1 hr
60.	Probes point No.2 fixed and calibrated	2 hrs

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Job No.	List of activities	Duration
61.	I.B.J.B. cover cable entry drilled	2 hrs
62.	[illegible]	½ hr
63.	O.B.J.B. and thrust bearing (TP) cover removed and governor be coupled	1 hr
64.	Top left O.B.J.B. removal	1 hr
65.	O.B.J.B. brackets mounted	6 hrs.
66.	Top half Ob.B.J.B. refixed	1 hr
67.	Probes point No.1 fixed and calibrated	2 hrs
68.	T.B.housing and inactive pad removed	1 hr
69.	T.B.housing and in active pad drilled and tapped	6 hrs
70.	T.B.housing and in active pad refixed	1 hr
71.	Probes Point No.10 fixed and caliorated	2 hrs
72.	O.B.J.B. covers cable entry drilled	2 hrs
73.	Governor coupled and O.B.J.B. cover replaced	2 hrs

VIBRATION PROBE INSTALLATION IN 103-J H.P. CASE

1.	O.B. cover opened	1 hr
2.	End plate removed	1 hr
3.	J.B.Top half removed	1 hr
4.	End plate drilled and tapped for 9,C and brackets mounted on J.B.tophalf for 8	6 hrs
5.	J.B. tophalf refixed	1 hr
6.	End plate refixed	1 hr
7.	Notch for key phasor drilled	2 hrs
8.	Probes point No.9, C, 8 fixed and calibrated	2 hrs
9.	O.B.cover replaced	½ hr
10.	I.B. covers and top of J.B. removed	1½ hrs
11.	Probe brackets mounted	6 hrs
12.	I.B.J.B. refixed	1 hr
13.	Probe (Point No.7) fixed and calibrated	2 hrs
14.	I.B. cover replaced	½ hr.

VIBRATION PROBE INSTALLATION IN 103-J-L.P.CASE

15.	I.B. cover removed	1 hr
16.	I.B.J.B. Housing removed	1½ hrs
17.	Probe brackets mounted	6 hrs
18.	I.B.J.B. refixed	1 hr
19.	Probe point A & 6 fixed and calibrated	2 hrs
20.	I.B.cover replaced	½ hr

NO.	List of activities	
21.	[illegible]	6 hrs
22.	Probe brackets mounted	1 hr
23.	O.B.J.B. refixed	2 hrs
24.	Probes point 5 fixed and calibrated	½ hr
25.	O.B. cover replaced	

VIBRATION PROBE INSTALLATION IN 103-J.T H.P. TURBINE

26.	O.B. cover opened	½ hr
27.	Top half J.B. removed	1 hr
28.	J.B.brackets mounted	6 hrs
29.	Top of J.B. refixed	1 hr
30.	Probe point No.4 fixed and calibrated	2 hrs
31.	O.B. cover replaced	½ hr
32.	I.B.J.B. cover removed	1 hr
33.	Top half I.B.J.B. removed	1 hr
34.	I.B.J.B. brackets mounted	6 hrs
35.	Top half I.B.J.B. refixed	1 hr
36.	Probes point 3 fixed and calibrated	2 hrs
37.	I.B.T.B. cover opened	1 hr
38.	T.B. housing and inactive pad removed	1 hr
39.	T.B. housing and inactive pad drilled and tapped	6 hrs
40.	T.B. housing and inactive pad refixed	1 hr
41.	Probe point B fixed and calibrated	2 hrs
42.	I.B.J.B. & T.B. cover replaced	1 hr

VIBRATION PROBE INSTALLATION IN 103-JBT TURBINE

43.	I.B. cover opened	1 hr
44.	Top half I.B.J.B. removed	1 hr
45.	I.B.J.B. brackets mounted	6 hrs
46.	Top half I.B.J.B. fixed	1 hr
47.	Probes (Point 2) fixed and calibrated	2 hrs
48.	I.B.J.B. cover replaced	1 hr
49.	O.B.J.B. and T.B. cover opened and governor decoupled	3 hrs
50.	Top half O.B.J.B. removed	1 hr

Job No.	List of activities	Duration
51.	O.B.J.B. brackets mounted	6 hrs
52.	Top half O.B.J.B. refixed	1 hr
53.	Probes (Point 1) fixed and calibrated	2 hrs
54.	T.B. housing and inactive pad removed	3 hrs
55.	T.B. housing and inactive pad drilled and tapped	6 hrs
56.	T.B. housing and inactive pad refixed	2 hrs
57.	Probes (Point No.10) fixed and calibrated	2 hrs
58.	Governor coupled and cover replaced	3 hrs

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NAP/

VIBRATION PROBES INSTALLATION ON 105-J -H.P.CASE

1 to 14 as indicated for 101-J HP Case

VIB .ATION PROBES INSTALLATION ON 105-J -GEAR BOK

15 to 37 as indicated for 101-J Gear Box

VEBRATION PROBES INSTALLATION ON 105-J -LP CASE

38 to 55 as indicated for 101-J LP case

VIBRATION PROBES INSTALLATION ON 105-JT-Turbine

56 to 73 as indicated for 101-JT Turbine.

BENTLEY NEVADA VIBRATION PROBE INSTALLATION

List of tools and tackles

Sr.No.	Description	Quantity
1.	Portable electric drilling machine (½" size)	1
2.	Portable electric drilling machine (¼" size)	2
3.	Spanner sot (Motric)	3 sets
4.	Spanner sot (inches size)	3 sets
5.	Allon key sets	3 sets
6.	Tap sets 10 x 32 TPI-Class 34 UNF thread	2 dozone
7.	Tap wrnches	6 Nos
8.	Die sets-10 x 32 TPI-Class 34, UNF threed	1 dozen
9.	Die wronches	3 Nos
10.	Straight shank drill bits number 21 (o.159"dia)	2 dozen
11.	Portable electric grinder	1
12.	Files set (rough)	2 sets
13.	Files set (smooth)	2 sets
14.	Welding set	1 No.

LIST OF MATERIALS

1.	Probe mounting breckets (M.S. aluminium)	100 Nos
2.	Hexagonal socket head allen screws with counter sunck head lith 10 x 32 TPI class 3A UNF throads (fully threaded) Material : 30455.	
	Length below head ¾"	250 Nos
	1"	250 Nos
	1¼"	250 Nos
	1½"	250 Nos.
3.	Mounting frames for proximeter housings.	24 Nos.
4.	M.S.Hexagonal headed bolts and nuts, B.S.W.Thread (fully threaded).	
	5/16" size x 1½" length	100 Nos.
	1/4" size x 1½" length	100 Nos.
	7/16" size x 1½" length	100 Nos.
	1/2" size x 1½" length	100 Nos.

Sr.No.	Description	Quantity
5.	Control panel	1 No.
6.	Hexagonal socket Allon Screws 10-32 TPI head	
	¾"	30 dozen
	1"	24 dozen
	1¼"	24 dozen
	1½"	24 dozen
7.	Tap sets	4 dozen
8.	Tap wrenches	1 dozen
9.	Die sets	2 dozen
10.	Die wrenches	½ dozen
11.	Probe brackets	15
12.	End plates for 101 J and 105 J	2 Nos.
13.	Stands for proximeter housings	60 Nos.

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NAP/

E L E C T R I C A L

Job No.	Activity No.	Job description	Time reqd in hours
1.11.01		66 KV Switch Yard Maintenance	3 days
	01	Cleaning of transformer bushings	
	02	Cleaning of Bus support insulators	
	03	Maintenance of all isolators	
	04	Cleaningof OCB & MOCBs and testing and replacing of oil.	
	05	Cleaning, peinting of structures	
	06	Cleaning and painting of PTS	
	07	Maintenance of 11 KV switch gear in 66 KV switch room.	
	08.	Maintenance of control & relay panel.	
	09.	Repairing hinges of PT selector switch boards.	
	10.	PT selector switch terminals to be repaired.	
	11.	Testing of all protective relays	
		MATERIAL REQUIREMENTS	
		C. T. C. — 100 bottles	
		Markin cloth — 100 mtrs	
		Petroloum jolley — 2 kgs.	
		Transformer oil — 25 berrels	
		Paint (Silver) — 50 litres	
1.11.02		MPSS Maintenance of 11 KV Panels	3 days
	01	Opening of bus bar chambers, cleaning & connection checking.	
	02	Replacing of oil in all circuit breaker tanks.	

Ammonia Plant

Sr.No.	Activity No.	Job description	Time reqd. in hours
	03	Testing of all protective relays	
	04	Testing of protection circuits.	
	05	MPSS battery discharging and giving fresh charge.	
	06	Maintenance of bettery charges.	
	07	Replacement of defective parts of OCBS by CRC Personnel.	
		Material Requirments.	
		Transfermer oil 25 berrels	2 days
		MCC - 5	
1.11.08	01	Maintenance of feoder trolleys.	
	02	Maintenance of LT breakers	
	03	Maintenance of busber chambers cleaning and chocking of connections.	
	04	Checking of lyre contracts & malamine supports.	
	05	Replacement of demaged malamine support.	
	06	Checking connections at transformer and.	
	07	Testing & calibration of protective relays	
	08	Maintenance of transformers	
	09	Checking connections of cables at transformer end.	
	10	Erection and commissioning of emergency panel for CT fans.	
	11	Hooking up of 180 KVA AMF set.	
		MATERIAL REQUIREMENTS	
		C.T.C. Bottles 25 Nos.	
		3 in one oil 2 oil cans full	
		Malamine supports 25 Nos	
1.11.04		General Maintenance	
	01	Cleening of LTBs in the plant	
	02	Cleaning of PD Bs	

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Ammonia Plant

Sr.No.	Activity No.	Job description	Time reqd. in hours
	03	Replacement of conveyor lights.	
	04	Maintenance of reclaim machine motor & panel.	
	05	Cleaning and painting of light fittings in Urea Plant.	
	06	Cleaning and painting in Bagging Plant.	
	07	Maintenance of all PB stations in the Plant.	
	08	Replacement of all push buttons in the lift (with rubber canopy at the top)	
	09	Measurement of earth resistance for all motors above 50 HP	
	10	Checking carthing continuity of all motors.	
	11	Measuring magger valves of all motors	
	12	Shifting the lighting JB on the top of prill tower.	
	13	Maintenance of sodium vapour lamps and control gear.	
	14	Replacing of cable of prill bucket motors	
	15	Arrangement for emergency power supply in MCCs	
	16	Maintenance and overhauling of packet panels.	
	17	LDS and stitching machine DB maintenance in Bagging Plant.	
		Materials Reqpuirement	
		2' fluorescent fittings 200 Nos.	
		Push button stations 20 Nos.	
1.11.05		Ammonia Plant 22 Motors overhauling as detailed below	14 days
	01	123-J Aux. Boiler Feedwater pump	
	02	2002 LJ Phosphate injection pump	
	03	120 J Ammonia injection pump	
	04	2001 LJ Hydrazing injection pump	

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Sr.No.	Activity No.	Job description	Time reqd. in hours
	05	127 J Quench pump	
	06	108 J Reflex pump	
	07	118 J Ammonia Transfer pump	
	08	108 JA Spare for Reflex pump	
	09	118 JA Stand by for 118 J	
	10	121 J Hot Ammonia Product pump	
	11	121 JA Standby for 121 J	
	12	170 J Stripped Condensate pump	
	13	170 JA Standby for 170 J	
	14	112 J Condesate pump standby	
	15	111 J MEA storage pump (Start up)	
	16	103 J Standby lube oil pump	
	17	101 & 105 J Standby lube oil pump	
	18	MIC 22 Standby hydraulic oil pump (Package pump)	
	19	2002 LL Phosphate Mixer (Agitator)	
	20	102 L Air filter	
	21	2004 J B. M. water pump	
	22	Dosing pump	

Material Requirements.

	DE	NDE		
121J	NRC 2125	V30217 DTS UEA	1 No.	)
112J	6315	7219 B	1 No.	)
103 J	6312	SKF 6312 ZZ	1 No.	) Each
101 & 105J	MRC 312 ZZ SKF	MRC 312 ZZ SKF	1 No.	)
2004J	6312 C3	6309 C3	1 No.	)

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UREA PLANT JOB LIST

Sr. No.	Description	Maint. job No.
1..	Siemens Turbine	2-01-01
2..	P. B. Compressor	2-01-02
3..	Pignone Turbine	2-01-03/03,04
4..	Pignone Compressor	2-01-03/01,02.05
5..	Prill tower I. D. Fans	2-05-01/06
6..	Changing the distance piece of II stage of P. B. Compressor	2-01-02/04
7..	Demister pads of intercooler/after cooler separators of centrifugal compressor to be replaced	2-05-01/02
8..	Lube oil console to be cleaned and oil to be checked - oil to be replaced, if necessary	2-05-01/01
9..	New H. P. Flush water valves to be installed	2-04-02/02
10..	Vent stack - horizontal portion on 4th floor to be replaced with Stainless Steel	2-05-01/05
11..	Prill Tower Serapar floor to be required - FRP layer has come out - Araldite cement layer to be laid.	2-07-02
12..	I.D. Fan floor on prill tower - bitumenustic layer to be repaired/relaid.	2-07-04
13..	H. P. Stripper foundations on Ist floor to be repaired	2-07-01

Modification Jobs :

1..	Gudgeon pin bushes of all the three stages of P. B. Compressor to be modified.	2.01.02/05
2..	Structure around H. P. Scrubber (H-1203) bottom to be provided.	2-08-02
3..	Structure around Bucket elevators to be dismantled - a contrete slab to be cast above the extended Prill Tower Conveyor/Link Product Conveyor.	2-07-05

1	2	3

2-03-01

Cooler Cleaning Jobs

(a) Chemical cleaning of the following coolers :

1..	Inter cooler and after coolers of Centrifugal CO_2 compressor (H-1111, H-1112).	2-03-01/02 2-03-01/01
2..	Surface condensor - H - 1114	2-03-01/03
3..	Inter Coolers of P. B. Compressor (H-1121, H-1122)	2-03-01/04
4..	Lube oil coolers for the oil console (H-1113)/K 1101-2 crank case (H-1123).	2-03-01/05
5..	C. .S. I cooler - H - 1206	2-03-01/05
6..	C.C.S. II cooler - H - 1204	2-03-01/04
7..	Flash tank condenser - H - 1421	2-03-01/04
8..	I stage evaporator condenser H 1423	2-03-01/04
9..	II stage evaporator I condenser - 1425	2-03-01/04
10..	II stage evaporator - II condenser-H 1426	2-03-01/05
11..	Vent condenser - H - 1502	

(b) Mechanical cleaning of the following coolers :

1..	Recirculation heater	2-03-02/01
2..	Desorber heat exchangers	2-03-02/02
3..	Desorber bottoms cooler	2-03-02/03

Maintenance Jobs (Routine nature)

1..	All RVs in the plant to be tested	2-04-01
2..	H. P. Check valves to be serviced	2-04-02/01
3..	H. P. flush water valves to be serviced	2-04-02/02. O.K
4..	Attending steam leaks (as per list)	2-06-01
5..	First isolation valve in steam inlet line to C-1101-2 is not holding - to be repaired	2-05-01/03

Inspection Jobs :

1..	H. P. Stripper to be inspected - H 1201	2-09-02/02
2..	CO_2 spray cooler - H 1104 -Epoxy painting	2-09-02/04
3..	Description column - V 1301	2-09-02/05
4..	4 Ata steam driven V 1501/Boiler inspection.	2-09-02/09
5..	I Evaporator H 1422	2-09-01/07
6..	II Evaporator - H 1424	2-09-01/07
7..	Weep holes checking of all H P equipment by air blowing.	2-09-01/14
8..	Urea solution - T 1401	2-09-04/02
9..	Ammonia water tank T 1301	2-09-04/01
10..	Inspection of H P equipment by Stemicarbon as desired by GM - details to be worked out.	
	- H. P. Scrubber - Visual inspection - thickness measurement of weld over lay. H-1203	2-09-02/01
	- H. P. Condenser - Tubes inspection - Thickness of weld overlay.	2-09-02/08
	- Auto clave - Liner thickness.	2-09-02/01

UREA PLANT JOB GROUPS

Urea Plant

Job No.	Description	Time reqd. in Hours
2.01.01	Overhauling of Siemens Turbine Q-1101-2	13 days
2.01.02	Overhauling of PB Compressor K-1101-2	21 days
2.01.03	Pignon compressor & turbine K-1101-1 Q 1101-1	4 days
2.02.01	Autoclave inspection (V 1201)	3 days
2.02.02	HP Condenser manway flange repair H 1202	6½ days
2.03.01	Caustic cleaning of coolers	9 days
2.03.02	Mechanical cleaning of coolers	8½ days
2.04.01	RVs to be tested	10 days
2.04.02	Flush line valves	13 days
2.05.01	Urea Plant minor jobs	7 days
2.06.01	Steam leaks to be attended (as per list)	6 days
2.07.01	Supports for HP stripper on 1st floor to to beattended	15 days
2.07.02	Repair floor of prill tower FRP lining to be redone	1 day
2.07.03	Opening of spray coolers for inspection & Cleaning and painting.	10 days
2.07.04	PTID fan floor-bituminustic layer to be relaid	8 days
2.07.05	Structure around bucket elevator to be dismentaled & concreting of extend P.T. conveyer	12 days
2.08.01	Structure H 1203 bottom	7 days
2.09.01	General inspection vessel, column, drums tank etc.	3 days
2.09.02	Vessels and tanks visual inspection	3 days
2.09.03	Heat Exchangers & coolers inspection	2 days
2.09.04	Tanks inspection	3 days
2.09.05	Pipeline thickness survey	24 days
2.10.01	Instrumentation jobs of urea plant	3 days
2.11.01	MCC - 6 Maintenance	18 days.
2.11.02	Urea plant 45 motors overhauling	

UREA PLANT ACTIVITIES

Urea Plant

Job No.	Activity No	Description	Time reqd in hours
2.01.01		Overhauling of Siemens Turbine Q-1101-2 for CO_2 compressor (Reciprocating)	13 days
	01	Remove insulation	
	02	Dismantle gear coupling & oil lines	1 day
	03	Check alignment prior to dis-assembly	½ day
	04	Check axial float & bearing clearance	
	05	Open up casing bolts	1 day
	06	Open front, rear & thrust bearings	
	07	Lift the top casing, inspection of rotor journal area etc	1 day
	08	Overhauling of relay cylinders, quick shut off valve, woodward governor, speed control governing system valves and linkage	3 days
	09	Check clean starting device, emergency governor & all oil lines	2 days
	10	Clean the top & bottom casing stationary nozzle rings & rotor of any deposits	2 days
	11	Assemble the rotor in the casing bearing & other accessories	2 days
	12	Check all the clearances	1 day
	13	Check turbine to gear box alignment	1 day
	14	Check overspeed trip	1 day

Material

1. Rotor
2. Journal bearings
3. Thrust bearings
4. Seals

1	2	3	4
2.01.02		Overhauling of Peterbrotherhood CO_2 Compressor K-1101-2(Receiprocating)	21 days
	01	Drain crank case oil	¼ day
	02	Remove 1st, 2nd & 3rd stage connecting rods for making spreader grooves in the gudgeon pin bush	2 days
	03	Dismantle 1st stage, change piston rings, wear bands, rod packing suction & discharge valve assemblies & record all clearances	3 days
	04	Dismantle 2nd stage remove cylinder and distance piece & install a new modified distance piece. Assemble cylinder, put new piston rings wear bands packing etc Record all clearances change manifold valves	5 days
		Making of spreader grooves in the workshop	3 days
	05	Check 3rd stage cylinder liner ovality	½ day
	06	Assemble all the 3 CRs in the poistion & check big end bearing main bearing clearances	3 days
	07	If bad, dismantle & send it for fitting of new liner to Bharat Pumps & Compressors Naini	15 days
	08	Assemble 3rd stage cylinders, piston rings wear bands, rod packings valve assemblies & measure all clearances	2½ days
	09	Check axial float of crankshaft main bearing clearance etc	1 day
	10	Clean crank case, charge flush oil circulate drain & then charge fresh oil	1 day
	11	Clean F.F. lubricator sump and all elements	½ day
	12	Check david brown gear box internals, journal and thrust bearing of all the wheels	2 days
	13	Check coupling pads	½ day
	14	Barring & no load run of the compressor	24 hours
	15		

Material

1. Piston ring
2. Wear Pads
3. Rod packing
4. Valve assemblies
5. Liner

1	2	3	4
		6. Coupling pads	
		7. 2nd stage distance piece & bearings for gear box	
2.01.03		PM of Pignone CO_2 Compressor & Turbines K-1101/1 and Q-1101-1	4 days
	01	Check radial & axial bearings of compressor	1 day
	02	Calibrate its vibration probe	1 day
	03	Check radial/axial brg of turbine & calibrate vibration probe	1 day
	04	Clean oil filter overhaul woodword governor, gauge glass	1 day
	05	Oil leak removal from compressor seal	
		Material	
		1. Compressor bearing	
		2. Turbine bearings	
		3. Seal	
2.02.01		Autoclave inspection (V-1201)	3 days
	00	Depressurising of autoclave	1 day
	01	Open the manway cover	½ day
	02	Removal of trays for inspection	1½ days
	03	Assembly of the trays and cover boxing	2 days
2.02.02		HP condenser manway flanges repair H-1202	6½ days
	01	Open manway cover	½ day
	02	Top cover & vessel flange repair by welding with special thermanit welding electrodes (19/15H) & machining	5 days
	03	Boxing up of the manway	1 day
		Material	
		1. Kemchand gasket	
		2. Special welding electrodes	

1	2	3	4
			9 days
2.03.01		Caustic cleanindof coolers	1 day
	01	Surface condenser H 1114	1 day
	02	Pignone compressor inter & acter coolers / H-1111, H-1112 /	1 day
	03	Peter Brother Hood Compressor coolers H-1121 H-1122	4 days
	04	Evaporation section coolers H1423,H1425 H-1206, H-1421	2 days
	05	Circulation system I & II cooler cleaning H-1206, H-1502, H 1204	½ day
	06	Lub cooler for H 1113 & H 1123 of K 1101-2	
		Material	
		1. Caustic tank	
		2. Caustic	
		3. Pump	
		4. Hose pipes	
			5 days
2.03.02		Mechanical cleaning of coolers	
	01	Recirulation heater H 1201	5 days
	02	Desorber heat exchangers-H 1301	
	03	Desorber bottom cooler H-1303	
			8½ days
2.04.01		All RVs to be tested	
	01	Pignone compressor RVs	
	02	PB compressor RVs	
	03	Ammonia System RVs	
	04	Carbamate pump RVs	
	05	LP system RVs	
	06	HP system RVs	
			10 days
2.04.02		Flush line Valves	
	01	Replacement of HP flush valves with Japanese valves	10 days
	02	Repair of HP system valves	5 days
		Material : 1. HP flush line valves	

Job No.		Description	Time reqd in hrs
2.5.01		Minor jobs Urea Plant	3½ days
	01	Lube oil console/overhead oil tank to be cleaned. Oil to be checked	2 days
	02	Demister pads of intercooler/after-cooler seperator of centrifugal compressor to be replaced.	2 days
	03	First isolation vlve in steam inlet line to Q-1101-2 is not holding. To be attended	¼ day
	04	NH3 discharge pump line additional supports to be provided.	2 days
	05	Vent stack near 4th floor to be repaired.	3 days
	06	Overhauling/inspection of P.T.I.D. fans	2 days
	07	Air Seal of scrapper bearing to be attended	¼ day
	08	PICV-1129 bypass valve gland leak to be attended to be modified	¼ day
		Material	
		1. Demister pads	
		2. 20" SS 304 L pipe Sch.10	
2.06.01		Steam leaks to be attended (as per list) and to attend the boiler inspection V1501	7 days
		Material	
		1. Steam traps	
		2. ½" & ¾" C.S. gat valves 150 #	
2.07.01		Support for HP stripper on 1st floor to be attended.	6 days
2.07.02		Repairing of floor of Prill Tower, FRP lining to be redone	15 days
2.07.03		Opening of Spare Cooler Pump, cleaning inspection & painting.	1 day
2.07.04		PTID fan floor - bituminustic layer to be relaied	10 days
2.07.05		Structure arround Bucket clevators to be dismentled- a cancrete slab to be cast above the eatended Prill Tower conveyer/ link produck conveyer.	2 days
2.08.01		Structure arround HP Scrubber H 1203 bottom	12 days
		Material	
		Platform for HP Scrubber- H 1203	

1	2	3	4
		Urea Plant Inspection Jobs	21 days
			7 days
2.09.01		General	
	01	Autoclave liner inspection to be carried out. Thickness to be measured.	
	02	4ata steam drum inspection/boiler inspection to be carried out.	
	03	Rectifying column separator to be inspected Gas outlet line to be inspected	
	04	Desorber to be inspected	
	05	Ammonia water tank to be inspected	
	06	Condensate tank to be inspected	
	07	Inspection of both the evaporators - H-1422, H-1424	
	08	Inspection of Urea storage tank	
	09	Urea solution filter to be inspected	
	10	Ammonia filter to be inspected	
	11	Pfill tower inside painting to be inspected	
	12	Thickness measurement of all HP pipes	
	13	Condensate from 9 ata to 4 ata bend D/S of level control valve (LCV-1502 A) to be checked for errosion/thickness	
	14	Weep holes checking all HP equipments by air blowing	
			3 days
2.09.02		Vessels & Tanks Visual Inspection	
	01	Autoclave V;1201 (Dye penetrant test of liner welding & liner thickness measurement)	
	02	HP Stripper H-1201 (Dye penetrant test of weldoverlay)	
	03	CO_2 knockout drum v-1101	
	04	CO_2 spray cooler H-1104	
	05	Desorption column V-1301	
	06	4-5 ata steam drum V-1501	
	07	Rectifying column	
	08	HP Condenser (Dye Penetrant test of welds overlay)	
	09	HP Scrubber K 1201 visuel inspection & thickness measurement of weld over lay.	

1	2	3	4
			3 days
2.09.03		Heat exchangers & coolers	
	01	Coolers of reciprocating compressor (H-1121 & H1122)	
	02	Cooler of Centrifugal compressor (H-1111 & H1112)	
	03	Separators of centrifugal compressors (V-1111 and V-1112)	
	04	Separators of reciprocating compressor (V-1121 & V-1122)	
			2 days
2.09.04		Tanks	
	01	Ammonia water Tank T-1301	
	02	Urea Storage tank T-1401	
	03	Condensate Tank T-1501	
2.09.05		Thickness measurement to be carried out of the following pipelines	3 days
	01	PR - 1204 - 8" - XI 22 PR - 1226 - 2"- X4	
	02	PR - 1203 - 8" - XI	
	03	PR - 1201 - 8" - XI	
	04	PR - 1224- 3" - X4	
	05	PR - 1225 - 3" x X4	
	06	PR - 1212 - 4" - XI	
	07	PR - 1202 -10" x XI	
	08	PR - 1208 - 4" - XI	
	09	PR - 1205 - 8" - XI	
	10	PR - 1205 - 6" - XI	
	11	CA - 1203 - 1" - XI	
	12	MA - 1106 - 4" - H2	
	13	PR - 1215 -16" - X6	
	14	PR - 1214 -12" - X6	
	15	PR - 1206 - 6" - X6	
	16	PR - 1206 - 14" - X4	
	17	GA - 1112 - 6" - F2	
	18	MA - 1201 - 3" - E2	
	19	MA - 1203 - 4" - X4	
	20	GA - 1202 - 1" - E2	
	21	PR - 1230 - 6" - XI	

UREA PLANT INSTRUMENTATION JOBS

Urea Plant

1	2	3	4
2.10.01		Instrumentation jobs of Urea Plant	24 days
	01	Q-1101-2 SL-1122 - Alarm unit to be calibrated	12 hours
	02	Q-1101-1 VM-1151 & VM-1152 both vibration probes to be replaced by new ones	24 hrs.
	03	Following control valves gland to be filled up & leakage to be stopped (a) PICV-1131 (b) LCV-1501	16 hrs.
	04	LC-1201 Tx Condensate to purge rotameter regulator knob gland is leaking. It is to be attended	8 hrs
	05	LR-1201 Ramma Rays source is to be changed by new source.	1 day.
	06	LRCV-1421/LCV-1101 Overhauling of valve actuator and valve positioner.	
	07	AUT/MAN Change over switches of all the Control Valves are to make free.	4 days
	08	V-1103 - Float type alarm switches to be replaced by new ones	12 hrs.
	09	FIC-1204 - Complete overhauling & checking of transmitters	
	10	FE-1124 Gland packings to be provided in both the isolation valves	2 hrs.
	11	Junction boxes electrical junction boxes to be replaced	120 hrs.
	12	Field pressure switches - calibration to be checked of all switches	48 hrs.
	13	PIC-1202 Tx (LP scrubber) leaking to be stopped in flange after 1st isolation valve	4 hrs.
	14	Following control valve hand jack mechanism to be overhauled: (a) LRCV-1421 (b) PICV - 1131 (c) LICV -1201 (d) FRCV-1102 (e) HICV-1221 A	40 hrs.

1	2	3	4
15	LRCV-1201 Valve positioner - Schrumberger new valve positionner is to be mounted		12 hrs.
16	Batteries - Checking of electrodes of all the batteries		60 hrs.
17	Thermocouples - changing of TRC-1201 & TR 1203 thermocouples		6 hrs.
18	Pneumatic junction boxes. All junction boxes to be cleaned.		24 hrs.
19	All control valves all valve positioner cleaning & stroke checking of all the control valves to be carried out		72 hrs.
20	Field Instrument - Calibrations of all the field transmitters (pressure, flow level temp. etc.) & pressure gauges to be carried out		72hrs.
21	Air regulators - overhauling of all the air regulators and flushing of all the instrument air lines		60 hrs.
22	Impulse lines & level control chambers Flushing of all the impulse lines & level control chambers to be carried out.		12 hrs.
23	Control room instrument - Overhauling & calibration of all the receivers, controllers recorders E/P converters, recorder switches & other instruments in control room & compressor panel instruments.		72 hrs.
24	Prill tower area - Cleaning of all instruments on prill tower area (Including all control valves)		24 hrs.
25	Fixing up Q-1101-1 and Q-1101-2 speed indicator in control panel.		12 hrs.
26	Volume boosters to be fixed in PICV-1130		4 hrs.
	Calibration of	a.. IR-1201 model 2 b.. LR-1201 model 3 c.. LH-1201	12 hrs.
27	Overhauling of all the rotameter/rotameter transmitters		24 hrs.

1	2	3	4
28	Q-1101-2. Turbine panel press. gauges location is to be changed		2 days
29	Following 1st isolation valve gland leakage to be attended;		
	(a) LC-1502 both isolation valve gland is leaking too much which is to be attended.		8 hrs.
30	LRCV-1201 to be inspected seat & plug (valve is passing)		24 hrs.
31	HICV-1202 to be is inspected		24 hrs.
32	HICV - 1101 passing		24 hrs.
33	PRCV - 1201 mode of operation to be changed from air fail to close to air fail to open		12 hrs.
34	Dynacraft calibration		12 hrs.
35	Providing digital RPM indicators for both the carbamate pumps with selector switch		24 hrs.

Materials

1..	LRCV - 1201	plug 4 seat
2..	MICV - 1101	plug 4 seat
3..	PRCV - 1201	Actuator
4..	Vibration probes	2 Nos
5..	P - 1204 A	½" size class 300 gate valve
6..	V-1103	Float switches 2 Nos.
7..	Electric junction boxes	8 Nos.
8..	LRCV - 1201 new valve positioner - 1 No.	
9..	Batteries - 12 nos.	
10..	Thermocouples Cr/Ac	2 Nos.

1	2	3	4
	37.	Hakshaw blade big & small	4 dozen each
	38.	Fevicoal	5 Kgs
	39.	Araldite 100 gms	1 dozen
	40.	Quick fix small	1 dozen
	41.	Aluminium sheet 24 gauge	3 rolls of 2' size
	42.	Tin cutter (small size)	3 nos
	43.	Mercury	2 Kgs
	44.	Nylong rope 1" size	50 mtrs
		½" size	50 mtrs
	45.	G.I. wire 18 gauge	1 roll
	46	Proximeter (low & high temp)	4 nos
	47	Grease stick 1/4", 1", 3/8"	1 dozen each
	48	Teflon tape ½" roll	2 dozen
	49	PVC insulation tape	2 dozen
	50	Cotton	1 dozen
	51	1/4" stud fitting SS & brass	4 dozen
	52	1/2" class 1500 globe valve	1 no
	53	1/2" stud fittings SS & brass	4 dozen
	54	1/4" SS tube	20 mts
	55	3/8" SS tube	20 mts
	56	1/4" SS tube	30 mts
	57	GM tube	6 nos
	58	Plastic sheets	1 roll
	59	Ammuniciator bulbs	100 nos
	60	Pressure gauges	
		0 - 6 Kg/cm^2	3 nos
		0 -10 Kg/cm^2	3 nos
		0 -25 Kg/cm^2	3 nos
		0 -100Kg/cm^2	3 nos
		0 -200Kg/cm^2	3 nos
	61	1/4" NPT plug SS	1 dozen
	62	1/2" NPT plug SS	1 dozen

1	2	3	4
	63,	3/8" NPT Plug SS	1 dozen
	64.	3/4" NPT x ½" NPT female SS	1 dozen
	65.	1/2" NPT male x 1/4" NPT female SS	1 dozen
	66	1/4" NPT male x ½" NPT female SS	1 dozen
	67	1/2" tube union SS	1 dozen
	68	1/4" tube union SS	1 dozen
	69.	1/4" nipple SS	1 dozen
	70.	1/" nipple SS	1 dozen
	71.	3/8" needle valve SS 800 PSI	6 noz
	72.	3/8" needle valve SS 800 PSI	6 nos
	73.	1/4" needle valve SS 800 PSI	6 nos
	74.	Air locking relay for HICV-1201	1 no
	75.	22 pin connector for battery charger	2 dozen

UREA PLANT ELECTRICAL JOBS

Urea Plant

1.	2	3	4
2.11.01		MCC-6	3 days
	01	Maintenance of feeder trollyes	
	02	Maintenance of LT breakers	
	03	Maintenance of busbar chambers cleaning & checking ofconnections.	
	04	Checking of lyrt contacts & malamine supports	
	05	Replacement of damaged malamine supports	
	06	Checking connections at transformer end.	
	07	Testing & calibration of protective relays	
	08	Maintenance of transformers	
	09	Checking connections of cables at transformer end.	
	10	Erection and commissioning of mergency panel for CT fans.	
	11	Maintenance of Konel Panel.	
	12	Removal of all unnecessary and components for bucket elevator controls from Konel panel.	

1.	2	Material Requirement	3	4
		1. C.T.C. bottles	25 nos	
		2. 3 in one oil	2 oil cans full	
		3. Malamine supports	25 nos	
2.11.02		Urea plant 45 motors overhauling as detailed below		18 days
	01	K-1102 A Anti corrosion air blower		
	02	K-1102 B Anti corrosion air blower		
	03	P-1106 A CO_2 spray cooler sump pump		
	04	P-1106 B CO_2 spray cooler sump pump		
	05	P-1113 B lube oil pump		
	06	P-1123 Lube oil pump for K-1101/2		
	07	P-1131 Lube oil pump for P 1102		
	08	P-1124 Lubricator K-1101-2		

1	2	3	4

09 P-1132 Gear box lube oil pump for P1102

10 P-1102-A LP carbamate circulation condensate system.

11 P-1202 B Lp Carbamate circulating condensate system one

12. P-1204 A HP Scrubber circulating condensate system two

13 Constant Head pump P 1205 A

14. P-1205 B constant Head pump

15 P-1231 A oil pump for P 1201

16 P-1231 B lube oil pump for 1201

17 P-1232 A Gear box lube oil pump for P1201

18 P-1232 B gear Box lube oil pump for P1201

19 P-1302 A Desorber feed pump

20 P-1302 B Desorber feed pump

21 K-1401/1 Prill tower fan

22 K-1401/2 Prill tower fan

23 K-1401/3 Prill tower fan

24 K-1401/4 A prill tower fan

25 M-1401/A prill tower equipment

26 M-1401/B Prilling equipment

27 P-1401/A Urea solution pump

28 P-1401/B urea solution pump

29 M-1402/1 Prill tower scrapper

30 M-1402/2 Prill tower scraper

31 M-1403 Prill tower conveyor

32 K-1405 Desorber extract fan

33 P-1501 Boiler feed pump

34 P-1501 Boiler feed pump

35 P-1503 Injection pump

36 P-1503 B injection pump

37 P-1506 Boiler start up feed pump

38 P-1102 B ammonia pump motor

39 P-1131 lube oil pump for Ammonia Pump P-1102 B

40 P-1132 Lube oil pump for gear box of P-1102 B

41 P 1304 A Ammonia Water Booster pump A

42 P-1210 A Bicrbonate pump A

43 P-1210 B Bicarbonate pump B

44 P-1304 A Ammonia Water Booster Pump B

45 P-1204 BHP scrubber circulating condensate system 2

Material

		ND	NDE	
1..	K 1102	6312 C3	6312 C3	1 No.
2..	P 1506	6310	6310	1 No.
3..	P 1302 B	NU314C3	6313 C4	1 No.
4..	P 1501	6310	6310	1 No.
5..	M 1403	6308	6308	1 No.
6..	P 1231 B	6206	6206	1 No.
7..	K 1401/2	6313 C3	6312 C3	1 No.
8 .	K 1401/4	6313 C3	6312 C3	1 No.

OFFSITES PLANT JOB LIST

Sr. No.	Description	Maint. Job No
1.0	**Raw Water System**	
1.1.	**Mechanical**	
1.1.1	Connect new by pass to existing leaky water header	3.05.04
1.1.2	Overhaul both the raw water pumps	3.01.01
	a. Completely dismantle both the pumps. Inspect all internal parts If required, replace or repair the parts.	3.01.01/03
	b. Overhaul gate valves on suction & discharge line.	3.01.01/07
	c. Clean Strainers	3.01.01/11
1.1.3	Overhauling of 10" gate valves for sand filter back washing purpose.	3.01.02
2.0	**Water Treatment Plant**	
2.1	**Mechanical**	
2.1.1	Overhauling of 4 nos. gate valves provided on Raw Water header for all four cations. These valves are not holding	3.02.01
2.1.2	Re-rubber line the cation No.1 and Anion II	3.02.02
2.1.3	Rectification of Middle laterals supports in all cations	3.02.04
2.1.4	Inspect all laterals & support of cations & anions & rectify as required	3.02.04
2.1.5	Clean & Check the sight glasses for cations.	3.02.04/08
2.1.6	Raching rings of degasser tower are to be taken out & after cleaning to be put back.	3.02.05
2.1.7	Inspection of DM water buffer tanks.	3.07.05
2.2	**Instrument Jobs**	
	Calibrate all gauges flow meters, transmitters etc also check solenoid valves.	3.08.03

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Sr. No.	Description	Maint. Job No
2.3	**Civil Works**	
2.3.1	Inspect all drains flooring etc and repair as required.	3.02.06/01
2.3.2	Reparing of cooling water make up sump and [illegible]C sump.	3.02.06/02
	Cooling Towers	
3.1	**Mechanical**	
3.1.1	Overhauling of cooling water pump No. P 4401 B	3.03.01
3.1.2	Check bearings alignment & repack glands for cooling water pump P-4401A, P4402 and P4403	3.03.02
3.1.3	Overhaul C W pump turbine Q4401A and B following jobs are to be carried out.	3.03.03
	a. Check bearings	3.03.03/03
	b. Dismantle complete turbine	3.03.03/01
	c. Check rotor	3.03.03/03
	d. Check carbon packing for steam leak	3.03.03/03
	e. Check governor assembly	3.03.03/05
	f. Check relay cylinder & overspeed mechanism.	3.03.03/06
	g. Check gears	3.03.08
	h. Clean oil filtersm oil coolers and sump	3.03.03/09, 11
	i. Replace lube oil	3.03.03/10
3.1.4	**C.W. P-4402**	3.03.04
	Rectification of non return valve, [illegible]	
3.1.5	All four C W pump gear boxes are to be inspected.	3.03.08
3.1.6	Gland packings of discharge isolation valves of cooling water pumps to be done.	3.03.05

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Sr No.	Description	Maint. Job No.
3.1.7	Clean cooling towe.r basin and pumps. Nozzles are to be cleaned and broken nozzles to be replaced.	3.03.06
3.2	Civil	
	Cooling tower wood and bolts inspection	3.07.05 3.04.01
4.0	Boilers	
4.1	Mechanical	
4.1.1	Soot blowers steam mater valves are passing to be rectified.	3.04.02
4.1.2	Non-return valves of BFW pump P5102A/ B P5103 are passing to be rectified.	3.04.03
4.1.5	Inspection of deaerator internals	3.04.04
4.1.6	Overhaul F D Fan & Turbine No.1 and 2	3.04.05
	a. Check bearings and regreas e	3.04.05/01
	b. Clean fan blades	3.04.05/02
	c. Check alignment	3.04.05/03
	Turbines	
	a. Check bearings	3.04.05
	b. Dismantle complete turbine	3.04.05/03
	c. Check rotor	3.04.05/01
	d. Check carbon packing for steam leak	3.04.05/04
	e. Check governor assembly	3.04.05/08
	f. Check relay cylinder & overspeed trip mechanism.	3.04.05/07
	g. Check gears	3.04.05/09
	h. Clean oil filters, oil cooler sump	3.04.05/10,11
	i. Replace lube oil	3.04.05/05
4.1.7	Annual inspection of boilers by Boiler Inspector.	

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Sr. No.	Description			Maint. Job No.
4.1.8	Inspection & cleaning offlue gas side from furnace to air heaters of Both Boilers.			3.04.01
4.1.9	Rectify 60 ata, 40 ata, and 4 ata, steam leakages as per list.			3.04.06
4.1.10	Overhule and test of safety valves as per list.			3.04.07
	Boilers			
	Steam drum	2+2	= 4	
	60ata after superheater	1+1	= 2	
	40 ata	1	= 1	
	14 ata	1	= 1	
	BFW pump	2		
	FD Fan	2	= 8	
	CWP	3		
	Deaerator Makeup pump	1		
4.1.11	Overhaule soot blowers			3.04.02
4.2	Civil			
	Repair of refractories inside furnace of both boilers			3.04.01/19
5.0	Storage Area			
5.1	Overhauling of Naphtha feed pumps and relief valves.			3.06.01
6.0	Instruments			
	Checking of all controllers, calibration of all pressure & temperature gauges.			3.08.01
	Water Treatment Plant			
1.	The existing (8"Ø) effluent segregation headers to be replaced with 12"Ø			3.05.01

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MODIFICATION JOBS IN OFFSITES PLANT.

SR No.	Description	Maint. Job No.
2.	To replace 50 mm Ø HCL outlet header from HCL storage tank with 80 mm, Ø.	3.05.02
3.	To lift all piping in northern trench of water treatment plant.	3.05.03

Cooling Towers

1.	To provide electric cum manual actuators for 700mm & 900mm isolation valves on cooling water headers.	3.05.05
	-	
	valve.	

Boilers

1.	Super heater coils of boiler No.2 to be replaced	3.05.07
2.	To provide 150mm Ø line for HCV 5153 by pass on 40 ata steam header control valve.	3.05.08

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OFFSITES PLANT - INSPECTION JOBS.

Sr No.	Description	Maint. Job No
A.	Boilers.	3.07.01
1.	Visual Inspection	3.07.01/01
	a. Steam drum	
	b. Mud Drum	
	c. Deareator	
2.	Random thickness measurement of super heater tubes.	3.07.01/02
3.	Dye penetrant test & radiography of welds after replacement of old super heater coils.	3.07.01/03
4.	Inspection of Refractories in both IJT Boilers	3.07.01/04
B.	Vessels	
1.	Visual Inspection & Spark test of following vessels.	
	a. Cations	
	b. Anion	
	c. HCl Tank	
	d. PMB & SMB	
C.	Pipe Lines	3.07.03
	Thickness measurement of lines upto 60 ata steam header.	
D.	Cooling tower wood and bolt inspection-Civil	3.07.04
E.	Inspection of NH_4 tank and DM water tank	3.07.05

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OFFSITES PLANT JOB GROUPS

Job No.	Description	Time
3.01.01	Overhauling of raw water pumps	4 days
3.01.02	Overhauling of 10" gate valves.	1 day
3.02.01	Overhauling of 4 nos. of valves of R/W header	2 days
3.02.01	Re-rubber linging of Cation I	25 days
3.02.03	Re-rubber lining of Anion II	28 days
3.02.04	Rectification/repair of supports & Inspection for all laterals and nozzles of cations and anions.	15 days
3.02.05	Reaching rings of degasser towers to be inspected.	3 days
3.02.06	Civil jobs for W T area	3 days
3.03.01	Complete overhauling of pump P4401 B	4 days
3.03.02	Check bearings, replac-ing of glands for P4401A, P 4402 P4403	3 days
3.03.03	Overhauling of Q 4401 B	4 days
3.03.04	Rectification of NR valve of P 4402	3 days
3.03.05	Gland repacking of 700mm & 900mm discharge valves.	1 day
3.03.06	Cleaning of cooling tower basin & sump nozzles are to be cleaned and broken ones to be replaced.	2 days
3.03.07	Repair of all suction screens of cooling water pumps	3 days
3.03.08	Inspection of gear boxes of all C W pump turbines.	5 days
3.04.01	Annual Inspection of boilers A & B	For A 8 days For B 25 days
3.04.02	Overhauling at soot blowers	6 days
3.04.03	Repair of N/R valves of P5102 A & B P5103	3 days
3.04.04	Checking of dearator internals	2 days
3.04.05	Overhauling of FD fan & Turbines	8 days
3.04.06	Repair of 60 ata, 40 ata & 4 ata steam leakages as per list.	6 days
3.04.07	Overhauling & testing of safety valves as per list - 16 nos.	3 days.

Offsite Plant

Job No.	Description	Time required
3.05.01	The existing 8"Ø effluent segregation header is to be replaced by 12" Ø	8 days
3.05.02	To replace 50mm Ø HCL outlet header from HCL storage tank with 80mm Ø	3 days
3.05.03	Lifting of all pipe dives in Northern trenches in WT Plant.	3 days
3.05.04	Connect new bypass to existing leaky raw wate header	4 days
3.05.05	Provide electrical cum manual actuator for 700mm and 900mm isolation valves on cooling water headers.	6 days
3.05.06	Steam line for Naphtha pump turbine	2 days.
3.05.07	Super heater coil replacement in Boiler No.2	25 days
3.05.08	To provide 150mm NB line for HCV 5153 bypass on 40 ata steam header.	4 days
		2 days
3.06.01	Overhaul relief valves on naphtha pumps & calibrate them	1 day
3.07.01	Boilers inspection	4 days
3.07.02	Vessels inspection	1 day
3.07.03	Pipe line inspection	2 days
3.07.04	Cooling tower wood work & bolt inspection	2 days
3.07.05	Inspection of D M water Buffer Tank	1 day
3.08.01	Instrumentation jobs in offsites boilers	14 days
3.08.02	Instrumentation jobs in offsites Ammonia handling and storage area	
3.08.03	Instrumentation jobs in DM Plant	

Offsite Plant

Job No.	Description	Time
3.08.04	Instrumentation jobs in C T area	
3.08.05	Instrumentation jobs in Air compressor and IG Plant	14 days.
3.11.01	Maintenance of MCC - I	3 days
3.11.02	Maintenance of MCC - 2	3 days
3.11.03	Maintenance of MCC - 2A	2 days
3.11.04	Maintenance of MCC - 2B/2E	2 days
3.11.05	Maintenance of MCC - 3	3 days
3.11.06	Maintenance of MCC - 4	3 days
3.11.07	Maintenance of MCC - 4A	1 day.
3.11.08	Maintenance of MCC - 7	2 day.
3.11.09	Maintenance of MCC - 8	4 days
3.11.10	Overhauling of 101 electrical motor of offsite plant.	14 days

[redacted] Plant...

Job No.	Activity No	Job description	Time required in hrs.
3.01.01		Overhauling of raw water pumps	4 days.
	01	Dismantling of pumps	
	02	Cleaning of all parts	
	03	Checking of parts & repair/replacement of worn out parts.	
	04	Assembly of pump	
	05	Gland packings	
	06	Alignments	
	07	Open suction & discharge gate valves.	
	08	Cleaning of valve body & seats.	
	09	Assembly of valves.	
	10	Opening of strainers.	
	11	Cleaning & boxing up.	
		Material	
		Spare parts for pump	
3.01.02		Overhauling of 10" gate valves for sand filter.back washing.	1 day.
	01	Opening of valves.	
	02	Cleaning of seats	
	03	Assembling the valve	
	04	Gland packing	
		Material	
		Gland packing.	
3.02.01		Overhauling of 4 nos. gate valves of Raw water header for all 4 cations.	2 days.
	01	Opening of valves.	
	02	Cleaning of seats.	
	03	Assembling the vaves	
	04	Gland packing	

1	2	3	4
3.02.01		Material	
		Gland packing	
3.02.02		Re-rubber ling of Cation I	25 days.
	01	Scaffolding outside tank with necessary tarpoline	
	02	Opening of Top & Bottom manholes	
	03	Removal of Resins	
	04	Opening of service acid outlet & R/W inlet headers.	
	05	Removal of old Rubber linging	
	06	Removal of laterals	
	07	Removal of old rubber lining	
	08	Fixing up of new supports	
	09	Grinding of welded joints & repairs	
	10	Soft blasting	
	11	Applying of primer coat	
	12	Applying of adhesive	
	13	Preparation of rubber sheets as per requirement	
	14	Laying of sheets in position	
	15	Spark testing before curing	
	16	Steam curing (half curing)	
	17	Spark test and inspection	
	18	Repair if any required	
	19	Final curing	
	20	Fixing up of laterals & nozzles	
	21	Resin filling	
	22	Header & Manhole boxing up	

3.02.02		Material	
		1. Bamboos	100 nos
		2. Coir rope	
		3. Tarpoline	
		4. Resin	
		5. Materials for rubber linging blasting cleaning are contractor's supply.	
		6. Latterals	
		7. Nozzles.	
3.02.03		Re-rubber lining of Anion II	28 days.
	01	Scaffolding outside tank with necessary tarpoline.	
	02	Opening of top & bottom manholes.	
	03	Removal of resins.	
	04	Opening service outlet acid outlet & R/W inlet headers.	
	05	Removal of old rubber lining	
	06	Removal of laterals.	
	07	Removal of old supports.	
	08	Fixing of new supports.	
	09	Grinding of welded joints & other repairs.	
	10	Shot blasting	
	11	Applying of adhesive	
	12	Applying of primer coat	
	13	Preparation of rubber sheets as per requirement	
	14	Laying of sheets in position	
	15	Spark testing before curing.	
	16	Steam curing (half curing)	

1	2	3	4
3.02.03	17	Spark test and inspection	
	18	Inspection if any required	
	19	Final curing	
	20	Fixing up of laterals & nozzles	
	21	Resin filling	
	22	Header & manhole boxing up	
		Materials	
		1. Bamboos	100nos.
		2. Coir rope	
		3. Tarpoline	
		4. Resin	
		5. Materials for rubber linging blasting & cleaning are contractor's supply	
		6. Laterals	
		7. Nozzles.	
3.02.04		Rectification/repair of middle supports and inspection for all laterals and nozzles in all cations and Anions.	15 days.
	01	Opening of top manhole	
	02	Opening of headers	
	03	Removal of resin if required	
	04	Repair for damaged laterals	
	05	Testing	
	06	Resin filling	
	07	Boxing up of top & bottom manhole & headers.	
	08	Clean and repair/replace sight glasses.	

1	2	3	4
		Material	
		1. Laterals	
		2. Nozzles	
		3. Bamboos	
		4. Coi Rope	
3.02.05		Reaching Rings of Degasser Towers are to be taken out and after clean up and inspection to be put lock.	3 days.
	01	Opening of manholes	
	02	Removal of Raching Rings.	
	03	Cleaning & Washing of Raching Rings.	
	04	Putting Back raching rings.	
	05	Boxing up manholes.	
		Material	
		1. Scaffolding for opening covers & removal of raching rings.	
		2. Raching Rings.	
3.02.06		Civil jobs for W T Plant	3 days.
	01	Inspect all drains floor of W/T plant and repair as required.	
	02	Inspect cooling water sump & RRC sump repair as required.	
3.03.01		Overhauling of C W pump P-4401-B	4 days.
	A.	Pump	
	01	Opening of casing	
	02	Removal of rotor assembly	
	03	Cleaning of parts	
	04	Repair/replacement of wornout parts	
	05	Assembly	
	06	Gland packing.	

1	2	3	4
3.03.01	B.	Gear Box	
	01	Removal of top casing	
	02	Checking of gear & bearings	
	03	Repari/replacement of worn off bearings.	
	04	Assembly.	
3.03.02		Check bearings, Repacking of glands for C W pumps P4401 A, P4402, P4403	3 days.
	01	Opening of bearings of pump one and check clearances and conditions.	
	02	Replace damaged bearings	
	03	Replace damaged bearings	
	04	Repalce bearing oil	
3.03.03		Overhauling of C W Pump, Turbines Q 4401/A & B	8 days.
	01	Opening of casing	
	02	Removal and checking of Rotar	
	03	Check/repair/replace rotar assembly, bearings, carbon packing.	
	04	Overhauling of trip valve assembly.	
	05	Overhauling of pilot & throttle valve	
	06	Assembly	
	07	Overhauling of governor assembly	
	08	Removal of old oil	
	09	Cleaning of sump, oil strainer & oil filters	
	10	Recharging fresh oil	
	11	Cleaning of oil coolers.	

1	2	3	4
3.03.03		Material 1. Rotor assembly 2. Carbon packing 3. Bearings 4. Filter elements 5. Oil turbine 17 & spares	
3.03.04		Rectification of NR Valve of C W Pump P 4402	3 days
	01	Opening of inspection cover	
	02	Removal of distance piece	
	03	Repair of flappers	
	04	O/H of damper valve	
	05	Replacement of damper valve gasket	
	06	Boxing up	
	07	Providing of drain point on lube of tank of gear box for P-4402	
		Material 1. Levers for flapper	
3.03.05		Gland repacking of 700mm & 900mm discharge valves.	1 day
3.03.06		Cleaning of cooling tower basin and sumps nozzles are to be cleaned and broken ones should be replaced	2 days.
3.03.07	R	Repair of all suction screens of C W Pumps.	3 days
3.03.08		Inspection of Gear boxes of all C W Pump and turbine.	5 days
3.04.01		Annual inspection of Boilers A & B Boiler A Boiler B	8 days 25 days
	01	Blinding of gas line	

1	2	3	4
3.04.01	02	Opening of all covers for ducting.	
	03	Opening of all mud holes.	
	04	Opening of side covers	
	05	Safety valve lapping	
	06	Gagging of safety valves	
	07	Repair of all gland packings of valves and steam leakages.	
	08	Cleaning of Boiler Tubes & flue gas side from furnace to air heaters.	
	09	Cleaning of steam drum & mud drum after removal of internals.	
	10	Opening of steam drum & mud drum	
	11	Boxing up of manholes of steam drums	
	12	Hydro test	
	13	Presentation of Boiler to Boiler Inspector	
	14	Repair of leaking ducting	
		Cleaning of gas nozzles.	
		Checking of air dampers	
		Checking of diffusers & changing if required.	
		Steam tracing for oil recirculation lines	
		Repair of refractory work on burner blocks, roof andfloof.	
		Repair of pannel wall by cauking of asbestos rope after welding of chats and applying refractory.	
		Boxing up all manhole covers.	
		Removal of gaggs and blinds.	
		Material	
		1. Refractory	
		2. Brushes	

1	2	3	4
3.04.01		Material	
		3. Gland packing	
		4. Gaskets Sheets	
		5. 5mm MS Okate	
		6. Insulating materials	
3.04.02		Overhauling of soot blowers of Boiler A & B	6 days
3.04.03		Repair of N/R valves of BFW pump P-5102 A & B P5103	3 days
3.04.04		Checking deaerator internals	2 days
	01	Opening of manhole covers	
	02	Checking of all bots & nuts	
	03	Internal Inspection	
	04	Boxing up	
3.04.05		Overhauling of FD Fan & Turbines No.1&2	8 days
	01	Check bearings & regrease	
	02	Clean Fan blades	
	03	Check alignment	
		Turbine	
	01	Open casing	
	02	Remove rotor assembly for inspection	
	03	Inspect bearings & replace if necessary	
	04	Inspect/replace carbon packings	
	05	Remove oil clean sump & recharge oil	
	06	Overhauling of pilot valves	
	07	Overhauling of trip valve	
	08	Overhauling of governor	
	09	Inspect Gear box	

1	2	3	4
	10	Clean oil strainers & Filters	
	11	Cleaning of oil coolers	
	12	Boxing up of turbines	
3.04.06		Repair of 60 ata, 40ata & 4ata steam leakages as per list.	6 days
3.04.07		Overhauling & testing of safety valves as per list (16 nos.)	3 days
		Boiler	
		Steam drum 2 + 2 = 4	
		60ata after superheater 1 + 1 = 2	
		40 ata 1 = 1	
		14 ata 1 = 1	
		BFW Pump = 2	
		F D Fan = 2	
		C W Pump = 3	
		Deaerator makeup Pump = 1	
3.05.01		The existing 8" Ø effluent segregation header is to be replaced by 122 Ø	8 days
		Material	
3.05.02		To replace 50mm Ø HCl outlet header from HCl storage tank with 80 mm Ø	3 day
		Material	
		Pipe 80 NB	
		Valve 80 NB (RL)	
3.05.03		Lifting of all pipes in northern trench in WT Plant.	3 day
		Material	

1	2	3	4
3.05.04		Connect new bypass to existing leaky raw water header. Material 1. 12mm CS Plate 12 T 2. 16mm CS Plate 2 T	4 days
3.05.05		Provide electric cum manual actuator for 700mm & 900mm isolation valve on cooling water header Material 1. Actuators for 900 Ø & 700 Ø Valves 2 nos.	6 days
3.05.06		Steam line for Naphtha pump turbine 01 Inlet steam line 02 Exhaust steam line Material : 1. Pipes 50 NB 2. Pipes 100 NB	2 days
3.05.07		Super heater coil in boiler No.2 is to be replaced.	25 days
	01	1st Half cooling down of boiler	9 hrs
	02	2nd Half cooling down of boiler	15 hrs
	03	Removal of duct	24 hrs.
	04	Removal of front plate, bottom and top plate	18 hrs.
	05	Removal of header	8 hrs
	06	Cutting inlet & outlet pipe to the header.	18 hrs.
	07	Taking out old tubes (36) by cutting	48 hrs.
	08	Cleaning & repairing of refractory	24 hrs.
	09	Cleaning & making end preparation and new tubes	48 hrs
	10	Cleaning & making end preparation of header joints.	72 hrs.
	11	Inspecting new tubes	72 hrs.

Offsite Plant

1	2	3	4
	12	Fixing of top header	6 hrs.
	13	Radiography & Welding (top)	74 hrs.
	14	Fixing of bottom header	8 hrs.
	15	Radiograph & Welding (bottom)	176 hrs.
	16	Welding of header joints	24 hrs.
	17	Radiograph & stress relieving	36 hrs
	18	Pressure testing	8 hrs
	19	Welding of plate	48 hrs
	20	Welding od duct	24 hrs

Commissioning activity

Material

1. Super heater coils 1½ cr, ½M tubes supplier by BHEL
2. Welding rods type
3. Welding rods type
4. Welding rods type
5. Filler wire type
6. Dy-penetrant items (i) cleaner
   (ii) penetrant
   (iii) developer
7. X-ray films
8. Refractories (i) white heat A
   (ii) Insulation Brick
   (iii) Fire crete super
   (iv) Castable - 1400
   (v) Angle supports
   (vi) Fire proof cement
9. C S Plate material type
10. Thickness
    Insulation (removal & replacement)

1

11 Argon gas
12 Acetelyne gas
13 Oxygen gas

3.05.08 To provide 150 N B line for HCV 5153 bypass on 40 ata steam header — 4 days

Material

1. L & Make 150 N B valves
2. Fitting Tee & elbows
3. 150 NB piping 12 mt.
4. Structural steel 2.5 T

Material

1.	Gate valve 200 NB	2 Nos
2.	Control valve	1 No
3.	Manual loader	1 No
4.	Copper tubing	200 mt.

3.05.06 Steam line for naphtha pump turbine — 2 days

01 Inlet steam line
02 Exhaust steam line

Material

Pipes 50 NB
Pipes 100 NB

2.06.01 Overhaul R. valves on naptha pumps & calibrate then — 1 days.

Inspection Jobs offsites plant

1	2	3	4
3.07.01		Boilers	4 days
	01	Visual Inspection 1. Steam drum 2. Mud drum 3. Deareator	
	02	Random thickness measurement of super-heater tubes.	
	03	Dye penetrant test & radiography of w welds after replacement of old super - heater coils	
	04	Inspect refractories inside both the IJT boilers	
3.07.02		Vessels Visual inspection & spark test of following vessels 1. Cations 2. Anions 3. HCl Tank 4. PMB & SMB	1 day
3.07.03		Pipe lines Thickness measurement of lines upto 60 ata steam header	2 days
3.07.04		Cooling tower wood & bolts inspection (Civil	2 days
3.07.05		Inspection of DM water buffer tank.	

1	2	3	4
3.08.01	B	Boilers	
	01	De-superheater line to be modified in Boiler No.1 and 2	2 days
	02	Installation of flame photometer	2 days
	03	New local panel to be fabricated and kept ready for installation in place of existing BFW pump panels and some impulse lines to be changed.	1 day
	04	Calibration & overhaule of all panel instruments viz receivers, recorders, ratio relays, computing relays contro- llers.	10 days
	05	Calibration & overhauling fall field transmitters and controllers	10 days
	06	Installation of inconel T/C's in flue gas chambers of either boilers.	2 days
	07	Back pressure control valve on ful line to be installed	1 day
3.08.02		Ammonia Handling & storage	
	01	Flare stack unit to be overhauled and setting to be checked	1 day
	02	Recirculation valves & pressure control valve stroke to be checked.	1 day
	03	Pressure switch and pressure gauges on Naphtha pumps, compressor etc are to be calibrated.	1 day
3.08.03		D M Plant	
	01	Supporting of cable trays to be carried out.	5 days
	02	50PSI air header to be provided for new panel for additional PMB/SMB stream	1 day
	03	Main air header also to be modified to provide direct piping connection to the new panl.	1 day

[redacted] plant

1.	2	3	4
3.03.03	04	Auto Operation to be extended to existing PMB/SM3 streams also (depending on performance of new timers) rewiring & dressing of the cables	4 days
	05	Overhaul & calibration of all pneumatic transmitters receivers & contrillers.	2 days
	06	All control valves diaphragms are to be checked. Top cover of the control valves are to be replaced.	10 days.
3.08.04		Air compressor and IG Plant	
	01	Thermowell pockets are to be provided on the air dryer	1 day
	02	All control valves to be overhauled in Boilers	4 days.

Material from item 3.08.01 to 3.08.05

1.	¼" C Steel pipe 40 Sch	100 mts
2.	½" C Steel pipe 40 Sch	100 mts
3.	¼" C.S. nipples 2½" long (threaded NP-TO)	50 Nos
4.	¼" U.S. coupling 2½" long threaded NPT	100 Nos
5.	¼" C.S. elbow threaded (F1 NPT)	50 Nos
6.	½" C.S. nipples 2½" long (M) NPT	50 Nos

1	2	3	4
3.08.05	7.	½" CS coupling 2"long (F) NPT	100 nos.
	8.	½" CS union weld type	50 "
	9.	½" CS union (F) threads (NPT)	50 "
	10.	½" CS equal Tee (F) NPT(threaded)	25 "
	11.	½" CS glob valve 40 Sch	25 "
	12.	¼" CS glob valves 40 Sch	50 "
	13.	3/8" CS glob valve 40 Sch	25 "
	14	½" OD PVC covered copper tubing 1.2 mm thickness	500 mts.
	15.	M S Angles 50 x 50 x 5 mm	100 "
	16.	40 x 40 x 5 mm	200 "
	17.	25 x 25 x 3 mm	200 "
	18.	Pipe wrenches 24" size	3 "
		16" size	6 "
		14" size	12 "
		12" size	12 "
		6" size	12 "
	19.	Good quality hacksaw blades	12 pkts.
	20.	Bench vice medium size	3 nos.
	21.	Trolley (4 wheelers 4' x 2' size)	1 no.
	22.	1/8" champion gasket sheet	2 sts.
	23.	1/32" copper sheet 1mt x 1 mt	1 "
	24.	Rustolene	50 tins
	25.	Kerosene	100 lts
	26	Cotton waste	200 kgs.
	27	Cloth waste	100 kgs.
	28.	Marking cloth	60 mts.

1	2	3	4
		MCC - I Maintenance	3 days
3.11.01	01	Maintenance of feeder trolleys	
	02	Maintenance of LT Breakers	
	03	Maintenance of busbar chambers cleaning & checking of connection	
	04	Checking of Iyra contacts & malamine supports.	
	05	Replacement of damaged malamine supports.	
	06	Checking connections at transformer end.	
	07	Testing and calibration of protect ive relays.	
	08	Maintenance of transformers	
	09	Checking connections of cables at transformer end.	
	10	Erection and commissionging of emergency panel for CT fans.	
		Material Requirements	
		C T C Bottles	25 nos.
		3 in 1 oil	2 oil cans full
		Malamine supports	25 nos.
3.11.02		MCC - 2 Maintenance	3 days
	01	Maintenance of feeder trolleys	
	02	Maintenance of LT breakers	
	03	Maintenance of busbar chambers cleaning and checking of connections	
	04	Checking of Iyra contacts and malamine supports.	
	05	Replacement of damaged malamine supports.	
	06	Checking connections at transformer end.	

	07	Testing & calibration of protective relays.	
	08	Maintenance of transformers	
	09	Checking connections of cables at transformer end.	
	10	Erection and commissioning of emergency panel for CT fans.	
		Material Requirement	
		C T C bottles	25 nos.
		3 in one oil	2 oil cans full
		Malamine supports	25 nos.
3.11.03		MCC - 2A - Maintenance	2 days
	01	Maintenance of feeder trolleys	
	02	Maintenance of LT breakers	
	03	Maintenance of busbar chambers cleaning & checking of connections.	
	04	Checking of Iyra contacts and malamine supports.	
	05	Replacement of damaged malamine supports	
	06	Checking connections at transformer end.	
	07	Testing and calibration of protective relays.	
	08	Maintenance of transformers.	
	09	Checking connections of cables at transformer end.	
	10	Erection and commissioning of emergency panel for CT fans.	
		Material Requirement	
		C T C bottles	25 nos.
		3 in 1 oil	2 oil cans full
		Malamine supports	25 nos.

1	2	3	4
3.11.04		MCC - 2B/2E Maintenance	2 days
	01	Maintenance of feeder trolleys	
	02	Maintenance of LT breakers	
	03	Maintenance of busbar chambers cleaning and checking of connections.	
	04	Checking of Iyra contacts & malamine supports.	
	05.	Replacement of damaged malamine supports.	
	06.	Checking connections at transformer end.	
	07.	Testing and calibration of protective relays.	
	08.	Maintenance of trnasformers	
	09.	Checking connections of cables at transformer end.	
	10	Erection and commissioning of emergency panel for CT fans.	
		Material Requirement	
		C T C bottles	25 nos.
		3 in 1 oil	2 oil cans full
		Malamine supports	25 nos.
3.11.05		MCC - 3 Maintenance	3 days.
	01	Maintenance of feeder trolleys	
	02	Maintenance of LT breakers	
	03	Maintenance of busbar chambers cleaning and checking of connections.	
	04	Checking of Iyra contacts and malamine supports.	
	05	Replacement of damaged malamine supports	
	06	Checking connections at transformers end	
	07	Testing & calibration of protective relays	
	08	Maintenance of transformers	
	09	Checking connections of cables at transformer end.	

1	2	3	4
3.11.05	10	Erection and commissioning of emergency panel for CT fans. Material Requirement C T C bottles 25 nos. 3 in 1 oil 2 oil cans full Malamine supports 25 nos.	
3.11.06		MCC-4 Maintenance	3 days
	01	Maintenance of feeder trollys	
	02	Maintenance of LT breakers	
	03	Maintenance of busbar chambers cleaning and checking of connections.	
	04	Checking of Iyra contacts & malamine supports.	
	05	Replacement of damaged malamine supports.	
	06	Checking connections at transformer end.	
	07	Testing and calibration of protective relays.	
	08	Maintenance of transformers.	
	09	Checking connections of cables at transformer end.	
	10	Erection and commissioning of emergency panel for C T fans.	
	11	To remove all unnecessary wiring from conveyor panel and necessary modification. Material Requirement C T C Bottles 25 nos. 3 in 1 oil 2 oil cans full Malamine supports 25 nso.	

1	2	3	4
3.11.07		MCC - 4 Maintenance	1 day
	01	Maintenance of feeder trolleys	
	02	Maintenance of LT breakers	
	03	Checking of Iyra contacts & malamine supports.	
	04	Maintenance of busbar chambers cleaning and checking of connections.	
	05	Replacement of damaged malamine supports.	
	06	Checking connections at trnasformer end.	
	07	Testing and calibration of protective relays.	
	08	Maintenance of transformers.	
	09	Checking connection s for cables at transformer end.	
	10	Erection and commissioning of emergency panel for CT fans.	
		Material Requirement	
		C T C bottles — 25 nos.	
		3 in one oil — 2 oil cans full	
		Malamine supports — 25 nos.	
3.11.08		MCC - 7 Maintenance	2 days.
	01	Maintenance of transformer	
	02	Maintenance of power distribution	
	03	Maintenance of Admn. A/C machines switch board.	
	04	Maintenance of all LDBs in Admn Block	
		Material Requirement	
		Markin Cloth	
		E E Fuses bases.	

3.11.09 MCC - 8 Maintenance 4 days

01 Maintenance of feeder trolleys

02 Maintenance of LT breakers

03 Maintenance of busbars cleaning and checking of connections.

04 Checking and cleaning of Iyra contacts

05 Replacement of damaged Malamine supports.

06 Maintenance of alternator set and its terminal box.

07. Installation and commissioning of one no. extension panel for emergency power for CT fans.

08 Installation & commissioning of byduct.

Material Requirement

Malamine supports	25 nos.
C T C Bottles	25 nos.
3 in one oil cans	2 nos.

For item 08 work contract given for material supply and erection.

3.11.10 Offsites & Material Handling 101 Motors overhauling as below

01 P 3103 A Ammonia Circulating Pump

02 P 3103 B Ammonia Circulating Pump

03 P 3102 A Ammonia Loading Pump

04 P 3102 B Ammonia Loading Pump

05 P 3201 A Fuel Unloading Pump

06 P 3201 B Fuel Unloading Pump

07 P 3202 A Fuel Oil Transfer Pump

08 P 3202 B Fuel Oil Transfer Pump

09 P 3301 A Naphtha Unloading Pump

10 P 3301 B Naphtha Unloading Pump.

1	2	3	4
	11	P 3302 A Naphtha Feed Pump	
	12	P 3302 B Naphtha Feed Pump	
	13	K 4201 B Degasser Blower	
	14	K 4202 A Mixed Bed Blower	
	15	K 4203 Cation Blower Exchanger	
	16	P 4203 D M Feed Pump (Standby)	
	17	P 4204 A C W Make up Pump	
	18	P 4204 B C W make up pump	
	19	P 4205 A NaOH Pump	
	20	P 4205 B NaOH Pump	
	21	P 4206 A Degasser Water Transfer Pump	
	22	P 4206 B Degasser Water Transfer Pump	
	23	P 4206 C Degasser Water Transfer Pump	
	24	P 4207 A NH4OH Pump	
	25	P 4207 B NH4OH Pump	
	26	P 4208 A Rinse recycle Pump	
	27	P 4208 B Rinse recycle Pump	
	28	P 4209 A D M Water Pump (Booster Pump)	
	29	P 4209 B D M Water Pump (Booster Pump)	
	30	P 4210 A HCl Transfer Pump A	
	31	P 4210 B HCl Transfer Pump B	
	32	P 4210 C HCl Transfer Pump C	
	33	H 4401/3 Cooling Tower fan (Ammonia)	
	34	H 4401/4 Cooling Tower fan (Ammonia)	
	35	H 4401/5 Cooling Tower fan (Ammonia)	
	36	H 4401/6 Cooling Tower Fan (Ammonia)	
	37	H 4401/7 Cooling Tower Fan (Ammonia)	
	38	H 4401/8 Cooling Tower Fan (Ammonia)	
	39	H 4402/1 Cooling tower fan (Urea)	
	40	H 4402/2 Cooling tower fan (Urea)	
	41	H 4402/3 Cooling tower fan (Urea)	

42 P 4402 Cooling water pump
43 P 4404 A Lube oil pump for M 4402
44 P 4404 B Lube oil pump for M 4402
45 P 4405/1 Lube oil pump for Q 4401/1
46 P 4405/2 Lube oil pump for Q 4401/2
47 P 4406 Lube oil pump for Q 4403
48 K 5102/1 Start up fan.
49 K 5102/2 Start up fan.
50 K 5103/1 Seal air fan.
51 K 5103/2 Seal air fan
52 P 5105/A Fuel oil pump
53 P 5105/B Fuel oil pump
54 P 5106/1 Turbine Aux. oil pump
55 P 5106/2 Turbine Aux. oil pump
56 P 5106/3 Turbine Aux. oil pump
57 P 5106/4 Turbine Aux. oil pump
58 K 5301 Inst. Air Compressor
59 K 5302 Plant Air Compressor
60 K 5402 Air Fan
61 M 2110 Plant Transfer Conveyor
62 M 2112 Fresh Urea Shuttle conveyor
63 M 2114 Tripper Unit
64 M 2116 Reclaim M/c. (Travelling)
65 M 2116 Reclaim M/c. (Lifting drive)
66 M 2116 Reclaim M/c. (Belt drive)
67 M 2116 Reclaim M/c. (Slewing drive)
68 M 2117 Reclaim M/c. (Chain Drive)
69 M 2121 Bagging Bldg. feed conveyor
70 M 2122 Bagging Hopper feed conveyor.

71	M 2102/1 Bag Stitching machine
72	M 2102/2 Bag Stitching Machine
73	M2102/3 Bag Stitching Machine
74	M2102/4 Bag Stitching machine
75	M2102/5 Bag Stitching Machine
76	M2102/6 Bag Stitching machine
77	M 2102/7 Bag stitching machine
78	M 2102/8 Bag stitching machine
79	M 2124/1 Slat Conveyor No.1
80	M 2124/2 Slat Conveyor No.2
81	M 2124/3 Slat Conveyor No.3
82	M 2124/4 Slat Conveyor No.4
83	M 2124/5 Slat Conveyor No.5
84	M 2124/6 Slat Conveyor No.6
85	M 2124/7 Slat Conveyor No.7
86	M 2124/8 Slat Conveyor No.8
87	P 4501/A Storm Effluent Pump
88	P 4501/B Storm Effluent Pump
89	P 4511 A Storm Water pump A
90	P 4511 B Storm Water pump B
91	P 4509 H_2SO_4 Dosing pump
92	T 4506 Motor for strirror of solution preparation tank
93	T 4508 Motor for strirror of Neutralisation Tank
94	P 4502 A Weak Effluent Pump
95	P 4502 B Weak Effluent Pump
96	K 4201 A Degasser Blower
97	K 4202 B Mixed Bed Blower
98	H 4401/1 Cooling Tower Fan (Ammonia)

99 H 4401/2 Cooling Tower Fan (Ammonia)

100 P 5105/C Fuel Oil Pump

101 Air Compressor

Material Requirement

	DE	NDE	
P 4204 A	6309	6309	1 no.
P 5106/2	6305 Z	6305 Z	1 no.
P 5106/2	6305 Z	6305 Z	1 no.
P 4202 A	6309	6309	1 no.
P 5106/2	6305 Z	6305 Z	1 no.
K 5301	NU 318	6318	1 no.
P 4501B	NU 314	6314	1 no.
T 4508	-	-	1 no.
P 1303 A	-	-	1 no.
M 2121	6311	6311	1 no.
M 2110	6308	6308	1 no.
M 2122	6310 Z	6310 Z	1 no.