PRE-FEASIBILITY REPORT (PFR)

for

PROPOSED TECHNICAL AMMONIUM NITRATE PROJECT FOR MANUFACTURING OF TECHNICAL AMMONIUM NITRATE, WEAK NITRIC ACID AND CONCENTRATED NITRIC ACID WITHIN CFCL'S EXISTING PREMISES

at

P.O. Gadepan, District- Kota, Rajasthan- 325208
(Schedule 5(a)-Category A)

Proposed By:

M/s Chambal Fertilisers and Chemicals Limited (CFCL)
P.O. Gadepan, District- Kota, Rajasthan- 325208

Environmental Consultant:

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UID No.: EQMS/PFR/CFCL/5(a)A/PR-03/01032022

Report Release Date: 01/03/2022 Revision No: 00

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M/S CHAMBAL FERTILISERS AND CHEMICALS LIMITED (CFCL)

Pre-feasibility Report (PFR) for Proposed Technical Ammonium Nitrate Project for Manufacturing of Technical Ammonium Nitrate, Weak Nitric Acid and Concentrated Nitric Acid within CFCL's Existing Premises at P.O. Gadepan, Kota, Rajasthan

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PROJECT DETAILS							
Name of Publication	Pre-feasibility Report (PFR) for Proposed Technical Ammonium Nitrate Project for Manufacturing of Technical Ammonium Nitrate, Weak Nitric Acid and Concentrated Nitric Acid within CFCL's Existing Premises at P.O. Gadepan, Kota, Rajasthan-325208 by M/s Chambal Fertilisers and Chemicals Limited (CFCL)						
Project Number	PR-03	Report No.	1	Version	1	Released	March 2022
Prepared & Managed By	Manager EIA			Released By		EIA Coordinator	

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1 EXECUTIVE SUMMARY

Chambal Fertilisers and Chemicals Limited (CFCL) is one of the largest private sector fertilizer producers in India. It accounts for nearly 15% of total urea production in the country as more than two decades company has contributed to the food security of the country with responsibility. Its Gadepan plant has three units i.e. Gadepan I, II & III are hi-tech nitrogenous fertilizer (urea) plants located at P.O. Gadepan in Kota district of Rajasthan. The plants have annual production capacity of about 3.9 million MT of Urea that contributes to major chunk of urea consumption in leading agri states of India. The plants were commissioned in 1994, 1999 and 2019, respectively. These plants use state-of-the-art technology from Denmark, Italy, United States and Japan.

Latest Environmental Clearance has been granted by MoEF&CC vide letter no. J-11011/664/2008-IA II (I) dated 16.11.2021 for existing plant having Ammonia Plant (6100 MTPD), Urea Plant (10800 MTPD), Captive Power Plant (55 MW), Steam HRSG (240 TPH), Steam Boilers (320 TPH) and Offsite Facilities. Plant also have valid CTO granted by RSPCB vide Order no. 2021-2022/PDF/4053 dated 21.01.2022 valid upto 31.12.2026.

Now, CFCL has proposed Technical Ammonium Nitrate Plant within CFCL's existing Premises for Manufacturing of Technical Ammonium Nitrate (700 MTPD), Weak Nitric Acid (600 MTPD) and Concentrated Nitric Acid (150 MTPD). Proposed plant would be new project to be installed in the vacant land available in the existing CFCL Complex. Details of Existing and Proposed products are mentioned in **Table 1.**

Table 1: Details of Existing and Proposed Products

S. No.	Product	Unit	As per EC granted	Proposed	After Expansion	Remark
1	Weak Nitric Acid (WNA)* as 100wt%	MTPD	0	600	600	**New Products**
2	Technical Ammonium Nitrate (TAN) as 100wt% (Melt / HDAN / LDAN) **	MTPD	0	700	700	
3	Concentrated Nitric Acid (CNA) as 100wt%	MTPD	0	150	150	
4	Ammonia	MTPD	6100	0	6100	**Existing Products- No Change**
5	Urea	MTPD	10800	0	10800	
6	Captive Power	MWH	55	0	55	
7	Steam (HRSG)	TPH	240	0	240	
8	Steam (Boiler)	TPH	320	0	320	

** Weak Nitric Acid (WNA) will be used as raw material for Ammonium Nitrate. Surplus if any will be sold as Weak Nitric Acid (WNA) and/or Concentrated Nitric Acid (CNA).*

*** Ammonium Nitrate (AN) solution will be Prilled to manufacture High-density Ammonium Nitrate (HDAN) and / or Low-density Ammonium Nitrate (LDAN) in quantities as per market demand. It may also be sold as Ammonium Nitrate (AN) Melt. Melt/HDAN/LDAN capacity will be 700 MTPD.*

Technical Ammonium Nitrate (TAN) is used primarily for all non-fertilizer applications. It is a key ingredient in pharmaceuticals, mining, power, construction, and steel industries. As proposed project is manufacturing of Technical Ammonium Nitrate which is an inorganic compound not covered under purview of EIA notification, 2006 however, manufacturing process of TAN is broadly similar to the Fertilizer manufacturing process hence, project is applied under category item no 5(a) i.e., Chemical Fertilizer as per the EIA notification, dated September 14, 2006 (as amended time to time) and it is to be treated as Category 'A'.

Project at a Glance is given in **Table 2.**

Table 2: Project at a Glance

S. No.	Particular	Unit	As per EC	Proposed	After Expansion	Remarks
1	Total Plot Area	Ha	400	0	400	No Change
2	Green Area	Ha	136.5	0	136.5	No Change
3	Fresh water Requirement	KLD	52371	2880	55251	Increase (Additional Fresh water requirement shall be met by existing permission for Raw water drawl from river)
4	Wastewater Generation- industrial	KLD	11305	1441	12746	Increase
5	Waste water Treatment section for Proposed Plant (ZLD Plant)	KLD	-	1440 (Min.)	1440 (Min.)	New ZLD unit
6	Wastewater Treatment Section for Existing Plant	M^3	Capacity of ETP & Holding Pond – 1800 m^3 + 2 X 90000 m^3	-	Capacity of ETP & Holding Pond – 1800 m^3 + 2 X 90000 m^3	No change
			Capacity of STP –	-	Capacity of STP – 1444 m^3 / day	No change

S. No.	Particular	Unit	As per EC	Proposed	After Expansion	Remarks
			1444 m^3 / day			
7	Waste water Treatment section for Existing G-3 Plant (ZLD Plant)	KLD	4800	0	4800	No change
8	Wastewater Generation- domestic	KLD	1272	20	1292	Increase
9	Power Backup (EDG)	MW	6.5	1.2**	7.7	Increase (Non-continuous use)
10	Project cost including Environmental controlling equipment	Rs. Crores	9136	1170	10306	Increase
11	Capacity of Boiler-Auxiliary	TPH	320	0	320	No Change
12	Capacity of Boiler-HRSG	TPH	240	0	240	No Change
13	Manpower Requirement (Direct)	No.	1020	100	1120	Increase

*** 1.2 MW is equivalent to 1500 KVA power.*

1.1 Plant location and area classification

The Plant is located at P.O Gadepan, Kota, Rajasthan. Site is well connected to NH-27. Total plot area of CFCL complex is 400 Ha. Proposed TAN plant shall be installed in 6 Hectare of vacant land available within the existing CFCL premises. The land breakup of the project is shown in **Table 3.**

Table 3 Land Breakup of Project Site

S. No.	Description	Area (Hectare)	Percentage (%)
1.	Plant areas *(Including proposed 6 Ha Plant area)*	187.0	46.8%
2.	Township	76.5	19.1%
3.	Green belt	136.5	34.1%
	Total	**400.0**	**100.0%**

1.2 Green belt

34.1% i.e., 136.5 ha area of total plot area is developed as green belt. More than 50m wide green belt is provided all around the boundary wall of project site. The industry has put in serious effort to create the greenery and the number of trees, plants, shrubs and herbs has increased considerably.

1.3 Water requirement

As per EC:

Fresh requirement of existing plant is 52371 KLD which is being sourced from River Kalisindh.

After Expansion:

After proposed Expansion, the total freshwater requirement of whole plant will increase to 55251 KLD. Additional water required (2880 KLD) is mainly required for cooling tower make-up, domestic purpose, DM water preparation required for steam generation through heat recovery from the process plants. Maximization of recycle and reuse of condensate and other water streams will be incorporated in plant design to reduce the freshwater requirement.

Additional, fresh water will be sourced from existing plants within CFCL premises. Existing plants draw raw water from Kalisindh River, where rainwater is harvested and stored in riverbed. CFCL has agreements with Water Resources department for raw water offtake from riverbed. The total water drawn from this source shall be within current limits prescribed for existing plants. Total approved drawl quantity is 30 cusec water (20 + 10) equivalent to 73,440 KLD.

1.4 Power requirement & supply/ source

As per EC:

The power requirement of the existing plant (55 MW) is being met by inhouse Captive power plant and Grid supply. The power is being generated by Natural gas-based turbine. The flue gas from turbine is being used as feedstock in HRSG to generate steam for plant operations. Plant is also having additional source of power supply from state grid for backup. Emergency power generator sets of 1.6 MW, 2.5 MW and 2.4 MW capacity are installed to keep the most essential equipment inline in the event of temporary power failure and to provide a safe shutdown of the plants in case of prolonged power failure.

After Expansion:

After proposed Expansion, there shall be requirement of additional 5 MW power. Electrical supply will be supplied from State Electricity Grid. Part supply may be from existing captive generation if required. Additional, Emergency diesel generator (EDG) of 1.2 MW capacity shall be installed to meet power requirements of plants in emergencies like power failure etc.

1.5 Effluent Management

As per EC:

Industrial Effluent: The total effluent generation from existing plant is 11305 KLD. This effluent is treated in respective treatment facilities (ETP, RO-ZLD Plant). G-III effluent is treated in RO-ZLD Plant and permeate is recycled as cooling water make up. Treated effluent from G-I and G-II Plants is used for irrigation in green belt with in CFCL's premises or discharged into River Kalisindh only during rainy season as prescribed in amended EC dated 16/11/2021.

Domestic: Total domestic effluent from existing plant is 1272 KLD which is being treated in three nos. of STP and reused in gardening.

After Expansion:

After proposed expansion, total industrial effluent generation will increase from 11305 KLD to 12746 KLD. Proposed plant industrial effluent generation will be 1441 KLD, out of which 1440 KLD wastewater will be treated in new installed ZLD unit and recycled as cooling water make-up. Remaining 1 KLD oily wastewater effluent generated mainly from rotary equipment's in proposed plant will be collected and routed to oil separator in existing ETP for oil separation.

Additionally, 20 KLD domestic effluent will be generated from proposed new plants. After proposed expansion, domestic effluent will increase from 1272 KLD to 1292 KLD which will be treated in existing Sewage treatment plants and further disposal into irrigation network with the CFCL premises.

1.6 Air emission & Management

The plant has different stacks from different sources and maintaining all emission norms prescribed by MoEF&CC/RPCB/CPCB. The PM generation from prilling tower is lesser than prescribed standard i.e., 0.5 Kg/MT of urea. Natural gas is being used as fuel of Boiler; hence emissions are negligible.

In proposed plant, major sources of air pollution in TAN, WNA and CAN plants are tail gas treatment & NOx abatement, reactions in pipe reactor between ammonia & nitric acid, prilling of TAN, spillage of TAN during bagging & other handling and through utilities. Appropriate stack and air pollution control system shall be provided for achieving the emissions standards by CPCB/RSPCB/MoEF&CC. Fugitive emissions from dryers/coolers, material handling, loading/ unloading and transport of material are minimal due to closed loop system and adequate control equipment like scrubbers and filters. Storage tanks shall be provided with fume absorbers as per available design. All the fugitive emissions from plants shall be passed through scrubber and/or bag filters as applicable. Details of existing and proposed stacks are given below in **Table 4.**

Table 4: Details of Stacks

Particular	Stack Height (m)	Air Pollution Control System	Parameter
Proposed			
Tail Gas Stack (in Nitric Acid Plant)	40 (minimum)	NOx Abatement system	NOx, NH3
Prilling Tower	50 (minimum)	Scrubber	PM, NH3
TAN Plant Stack/Scrubber	30 (minimum)	Scrubber	PM, NH3, NOx
Concentrated Nitric Acid	30 (minimum)	Scrubber	NOx, NH3
Emergency Diesel Generator	30 (minimum)	Non-continuous Emission	PM, SO2, NOx, NMHC
Existing			
Particular	**Stack Height (m)**	**Stack Dia (M)**	**Parameter**
Auxiliary Boiler-I (80 TPH)	30	2.0	NOx
Auxiliary Boiler-II (80 TPH)	30	2.0	NOx
HRSG-I (70 TPH)	30	3.0	NOx
HRSG-II (70 TPH)	30	3.0	NOx
Prilling Tower-I	104	26.0	PM Ammonia
Primary Reformer-Ammonia-I	40	3.0	NOx
EDG Set (1.6 MW)	19	0.45	PM NMHC

			CO
			NOx
Auxiliary Boiler No. III (160TPH)	35	2.5	NOx
Prilling Tower-II	118	26	PM
			Ammonia
Primary Reformer - Ammonia-II	55	4.1	NOx
EDG Set (2.5 MW)	30	0.9	PM
			NMHC
			CO
			NOx
HRSG CPP (100 TPH)	43.5	3.0	NOx
Prilling Tower	141.5	28.0	PM
			Ammonia
Primary Reformer - Ammonia-III	53.8	4.1	NOx
EDG Set (2.4 MW)	30	0.5	PM
			NMHC
			CO
			NOx
Dedusting- G-I (Scrubber Packing Plant)	37.00	1.000	PM
Dedusting - G-II (Scrubber Packing Plant)	35.73	0.400	PM
Dedusting Unit - G-III (Scrubber Packing Plant)	37	1.1	PM
Dedusting Unit Screen House (Scrubber Screen House)	27.80	0.650	PM
Dedusting Unit-G-III Screen House (Scrubber Screen House)	34	0.8	PM

1.7 Solid & Hazardous waste management

There will be slight increase in the Municipal waste/Hazardous waste/Industrial waste from proposed plant which will be disposed as per applicable norms. There is generation of different kind of Industrial wastes from production process and other activities. Hazardous waste is being sent to Authorized Recycler/TSDF site while other solid wastes are segregated in recyclable/salable and non-salable/non-recyclable waste. Salable/recyclable waste are sold to approved recycler/vendor and non-salable/non-recyclable waste sent to Udaipur, TSDF.

Details of Waste generation are given below in **Table 5.**

Table 5: List of Hazardous Waste

Sr. No	Name of Waste	Source of Generation	Category	As per EC	Proposed/ Additional	After Expansion	Disposal Method
1	Discarded containers, drums	Receipt, storage and handling of raw / packing materials	Sch-I/33.1	1000 nos. per year	500 nos. per year	1500 nos. per year	Collection in drums, storage and transportation to authorized recyclers / authorized TSDF
2	Used/Spent Oil	Process / rotary machines / transformers	Sch-I/5.1	107 MTPA	20 MTPA	127 MTPA	Collection in drums, storage, transportation and sales to authorized recyclers.
3	Spent Catalyst	Process	Sch-I/18.1	660 MTPA	0.1 MTPA	660.1 MTPA	Regeneration / Recycle through catalyst supplier
4	NOx abatement Spent Catalyst	Nitric Acid Plant	Sch-I/18.1	0	10 MT in 5 years	10 MT in 5 years	Collection in drums, storage and transportation to authorized recyclers / authorized TSDF.
5	Chemical sludge from wastewater treatment	Wastewater treatment schemes	Sch-I/35.3	17000 MTPA	900 MTPA	17900 MTPA	Chemical Sludge from wastewater treatment scheme is being disposed to cement plants for co-processing / TSDF, Udaipur
6	Contaminated cotton waste or other cleaning materials	Maintenance and cleaning activities	Sch-I/33.2	12 MTPA	5 MTPA	17 MTPA	Collection, storage and transportation to Common incinerator

- The municipal solid waste generation at the plant area and township is being segregated in biodegradable waste and recyclable waste. Recyclable waste is being sold off to authorized vendors. Biodegradable waste is being feed to onsite Bio-gas plant. The biogas is used for cooking in CFCL Guest House, and the liquid manure is used for horticulture. The filtered liquid is recycled back into the digester. Same practices shall be followed in the proposed plant.
- Minor E-waste and Battery waste are also generated from the Plant which is disposed as per E-Waste (Management) Rules, 2016 and Battery Waste Management Rules, 2020 respectively. Waste from Dispensary are disposed as per Bio-medical Waste Management Rules, 2016.

1.8 Noise management

The plant has various machines like dryers, blowers, vacuum pumps, process pumps, compressors, EDG set, etc. which generate noise. These machines shall have inbuilt appropriate control measures to maintain the noise levels within limits. EDG will have acoustic enclosure.

Generally, noise levels of working place are controlled within the limit as specified in the standard of MoEF&CC. However, the noise level of various machines like Compressors, blowers, fans, and elevators are taken care in the design stage itself to meet the legal requirements. Noise level at Boundary Fence are controlled by providing green belt throughout the boundary wall of plant. After proposed expansion, all these measures shall be followed in proposed plant to reduce noise level

2 INTRODUCTION

Ammonium nitrate (NH_4NO_3) is produced by neutralizing nitric acid (HNO_3) with ammonia (NH_3). Ammonium Nitrate is a popular fertilizer globally, but its application as fertilizer is not permissible in India. In India, it finds its application mainly in manufacturing Industrial Explosives. Ammonium nitrate is employed to modify the detonation rate of explosives, such as nitroglycerin in the so-called ammonia dynamites, or as an oxidizing agent in the ammonals, which are mixtures of ammonium nitrate and powdered aluminum. Technical Ammonium Nitrate (TAN) is used primarily for all non-fertilizer applications. It is a key ingredient in pharmaceuticals, mining, power, construction, and steel industries.

Proposed project will manufacture Weak Nitric Acid (WNA), Concentrated Nitric Acid (CNA) and Technical Ammonium Nitrate (TAN). In India, Technical Ammonium Nitrate (TAN) is primarily used to manufacture explosives for mining. Coal mining, limestone for cement manufacturing, iron ore mining and stone quarrying activities require controlled blasting, thus need Ammonium Nitrate (TAN) based explosives.

2.1 Identification of Project & Project Proponent

2.1.1 Identification of Project

CFCL has proposed Technical Ammonium Nitrate Plant within CFCL's Existing Premises for Manufacturing of Technical Ammonium Nitrate (700 MTPD), Weak Nitric Acid (600 MTPD) and Concentrated Nitric Acid (150 MTPD). Proposed plant would be new project to be installed in the vacant land available in the existing CFCL Complex. Details of Existing and Proposed products are mentioned in **Table 6.**

Table 6: Details of Existing and Proposed Products

S. No.	Product	Unit	As per EC granted	Proposed	After Expansion	Remark
1	Weak Nitric Acid (WNA)* as 100wt%	MTPD	0	600	600	**New Products**
2	Technical Ammonium Nitrate (TAN) as 100wt% (Melt / HDAN / LDAN) **	MTPD	0	700	700	
3	Concentrated Nitric Acid (CNA) as 100wt%	MTPD	0	150	150	
4	Ammonia	MTPD	6100	0	6100	**Existing Products- No Change**
5	Urea	MTPD	10800	0	10800	
6	Captive Power	MWH	55	0	55	
7	Steam (HRSG)	TPH	240	0	240	
8	Steam (Boiler)	TPH	320	0	320	

** Weak Nitric Acid (WNA) will be used as raw material for Ammonium Nitrate. Surplus if any will be sold as Weak Nitric Acid (WNA) and/or Concentrated Nitric Acid (CNA).*

*** Ammonium Nitrate (AN) solution will be Prilled to manufacture High-density Ammonium Nitrate (HDAN) and / or Low-density Ammonium Nitrate (LDAN) in quantities as per market demand. It may also be sold as Ammonium Nitrate (AN) Melt. Melt/HDAN/LDAN capacity will be 700 MTPD.*

Ammonium Nitrate is a crystalline, white salt of ammonia and nitric acid, used widely in the production of fertilizers and explosives globally. It is highly soluble in water; solid Ammonium Nitrate can undergo explosive decomposition when heated in a confined space. Two grades of Ammonium Nitrate are in use ‐ Melt Grade and Technical Grade (Prilled or Granulated).

2.1.2 Identification of Project Proponent:

Chambal Fertilisers and Chemicals Limited (CFCL) is one of the largest urea manufacturers in India. CFCL urea production accounts for nearly 15% of the total Urea produced in the country. Since more than two decades company has contributed to the food security of the country with responsibility. Its three hi-tech nitrogenous fertiliser (urea) plants are located at Gadepan in Kota district of Rajasthan. The three plants have an installed annual production capacity of about 3.9 million MT of Urea contributing to major chunk of Urea consumed in leading agri states in India. These plants were commissioned in 1994, 1999 and 2019 respectively. These plants use state-of-the-art technology from Denmark, Italy, United States and Japan.

The Gadepan III Plant commissioned recently is a state-of-art fertilizer unit. It is among the most efficient plants in the world, both from energy consumption and environment perspective, and uses the latest technologies from KBR, USA and Toyo Engineering Corporation, Japan. The new plant has an installed annual production capacity of about 1.34 million MT of Urea.

The Company caters to the need of the farmers in ten states in northern, eastern, central and western regions of India and is the lead fertiliser supplier in the State of Rajasthan, Madhya Pradesh, Punjab and Haryana. The Company has a vast marketing network comprising 19 regional offices, 2800 dealers and 50,000 retailers. The company holds highest market share among private sector Urea manufacturers in the country. The company has further strengthened its position as lead fertilizer manufacturer in India after the commissioning of Gadepan III plant.

The Company has donned the mantle of providing all agri-products through a 'single window' to enable the farmer to buy all products from one source. The Company dealers provide Urea and other agri-inputs like DAP (Di-Ammonium Phosphate), MOP (Murate of Potash), NPK fertilizers, Specialty Nutrients and Crop Protection Chemicals. Most of these products are sourced directly from reputed global suppliers and sold under the 'Uttam' brand.

To promote sustainable farming practices, Chambal has a well-structured farmer advisory programme. Under this programme, the company organizes crop seminars, product and field demonstrations and farmer meets. Soil and water analysis is also conducted for free at Chambal's laboratories and based on the results; Chambal experts emphasize on balance use of fertilizers.

To encourage the new age farmer, a website, 'uttamkrishi.com', provides information on the weather, suitable cropping techniques and markets in Hindi language. 'Hello Uttam' toll-free telephonic helplines have been set up to answer the queries raised by farmers. Unemployed youth from villages are enrolled as 'Uttam Krishi Salhakars'. They are trained in the latest farming techniques and provide specialized services to farmers.

The company has won the Sword of Honour from the British Safety Council for two consecutive years. It has been awarded ISO 14001 (Environment Management System Standard), ISO 9001 (Quality Management System Standard) and ISO 45001 (Occupational Health and Safety Management System Standard) certifications.

Chambal is committed to its social responsibilities and has invested in water harvesting, healthcare, rural infrastructure, education, skill development and women empowerment. Chambal constantly tries to improve the quality of life in the areas where we operate. The Company has won several coveted awards for its Corporate Social Responsibility and Environmental performance. Partial list of awards is as under:

- Fertiliser Association of India (FAI) award 2020-21 for Technical Innovation.
- Fertiliser Association of India (FAI) award 2020-21 for Best Production Performance Gadepan-III Plant.
- Fertiliser Association of India (FAI) award 2020-21 for Excellence in Safety.
- Fertiliser Association of India (FAI) award 2020-21 for Environment Protection.
- Fertiliser Association of India (FAI) award 2020-21 for Best Video Film.
- Environmental Protection award 2019~20 by Fertiliser Association of India (FAI)
- Factories Safety Award 2021 by Ministry of Labor and Department of Factories and Boiler, Rajasthan.
- FAI Energy Award 2019~20 :"Second prize" for the efforts in Energy conservation to Chambal Fertilisers and Chemicals Limited Gadepan-II
- Rajasthan CSR Excellence Award 2019
- ASSOCHAM Best NGO Award 2019 for Skill Development
- "First Prize" Rajasthan Energy Conservation Award 2018
- 2018 Rajasthan Government CSR Excellence Award
- 2018 Best Industry Partner in Skill Development by Government of Rajasthan
- 2018 Bhamashah Award By Government of Rajasthan
- 2017 Environment Protection award" from Fertilizer Association of India (FAI).
- "Rajasthan Energy Conservation Award-2015" by Govt. of Rajasthan, department of energy, Jaipur.
- "Environment Protection award" for the year 2013-14 from Fertilizer Association of India (FAI).
- "National Award for Prevention of Pollution for the year 2010-11" under Fertilizer category, and awarded by Ministry of Environment & Forest (Govt. of India).
- "FICCI Safety system Excellence award for Manufacturing 2013" by FICCI, New Delhi.
- "National Award for Excellence in Water Management 2012" by Confederation of Indian Industry (CII).
- "FAI Award for Best overall Performance of an operating fertilizer unit for nitrogen (Ammonia and Urea)" (Runners Up Award) for the year 2011-12 and 2017~18 from Fertilizer Association of India (FAI)

- "Environment Protection award" for the year 2011-12 from Fertilizer Association of India (FAI) (1st for third consecutive year)
- "Environment Protection award" for the year 2010-11 from Fertilizer Association of India (FAI).
- "FAI Award for Best overall Performance of an operating fertilizer unit for nitrogen (Ammonia and Urea)" (Runners Up Award) for the year 2010-11 from Fertilizer Association of India (FAI)
- "National Award for Excellence in Water Management 2011" by Confederation of Indian Industry (CII).
- "National Award for Excellence in Energy Managemet-2011" by Confederation of Indian Industry (CII), Hyderabad for Gadepan-II plant.
- "Environment Protection award" for the year 2009-10 from Fertilizer Association of India (FAI).
- "Best Technical Innovation Award" for the year 2009-10 from The Fertilizers Association of India (FAI).
- "Rajasthan Energy Conservation Award-2009" by Govt. of Rajasthan, department of energy, Jaipur for Gadepan-II plant.
- "IFA Green Leaf Trophy Award" for excellence in safety, health and environment.
- "Sword of Honour for the year 2008" by British Safety council for excellence in Occupational Health & Safety Management system.
- "Five Star Safety (Awarded with 5 - Star Rating)" – in the year 2008 by British Safety Council.
- 'Sword of honor for the year 2007" by British Safety Council.
- "Five Star Safety (Awarded with 5 - Star Rating with 92.9% Points)" – in the year 2007 by British Safety Council.
- "FAI Award for Best Performance among Nitrogenous fertiliser plants" (Runners Up Award) for the year 2005-06 from Fertiliser Association of India (FAI)
- "Five Star Safety (Awarded with 5 - Star Rating with 95.2% Points)" – in the year 2006 by British Safety Council.
- "Environment Protection award" for the year 2004-05 from Fertiliser Association of India (FAI)

Project Proponent: M/s Chambal Fertilisers and Chemicals Limited

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Mobile No.	**:** 0744-2782023

2.2 Brief description of nature of Project

Technical Ammonium Nitrate (TAN) is used primarily for all non-fertilizer applications. It is a key ingredient in pharmaceuticals, mining, power, construction, and steel industries. As proposed project is manufacturing of Technical Ammonium Nitrate which is an inorganic compound not covered under purview of EIA notification, 2006 however, manufacturing process of TAN is broadly similar to the Fertilizer manufacturing process hence, project is applied under category item no 5(a) i.e., Chemical Fertilizer as per the EIA notification, dated September 14, 2006 (as amended time to time) and it is to be treated as Category 'A'.

2.3 Need for the project and its importance to the country

Ammonium Nitrate is a popular fertilizer globally, but its application as fertilizer is not permissible in India. In India, it finds its application mainly in manufacturing Industrial Explosives. Besides, it has other application in manufacturing Nitrous Gases for anesthetic purpose. However, its primary demand (>98%) is in Explosives Industry, the demand for which is driven by the mining and Infrastructure activities in the country. Coal mining, lignite mining, cement manufacturing, limestone mining, ore mining and stone quarrying activities require control blasting, thus need Ammonium Nitrate (AN) based explosives. Current demand is higher than domestic production of Ammonium Nitrate (AN). During year 2020-21, domestic production was close to 758,000 MT, whereas demand was 993,000 MT. Gap in demand-supply i.e., about 235,000 MT is met through imports.

Gap in demand-supply and expected Compound Annual Growth Rate (CAGR) of 5~6%, requires enhancement of domestic production of Ammonium Nitrate (AN). Government of India's "**Atmanirbhar Bharat**" campaign further supports addition to the domestic production.

Chambal Fertilisers and Chemicals Limited (CFCL) has adequate quantity of surplus technical ammonia and can convert surplus ammonia into Ammonium Nitrate (AN).

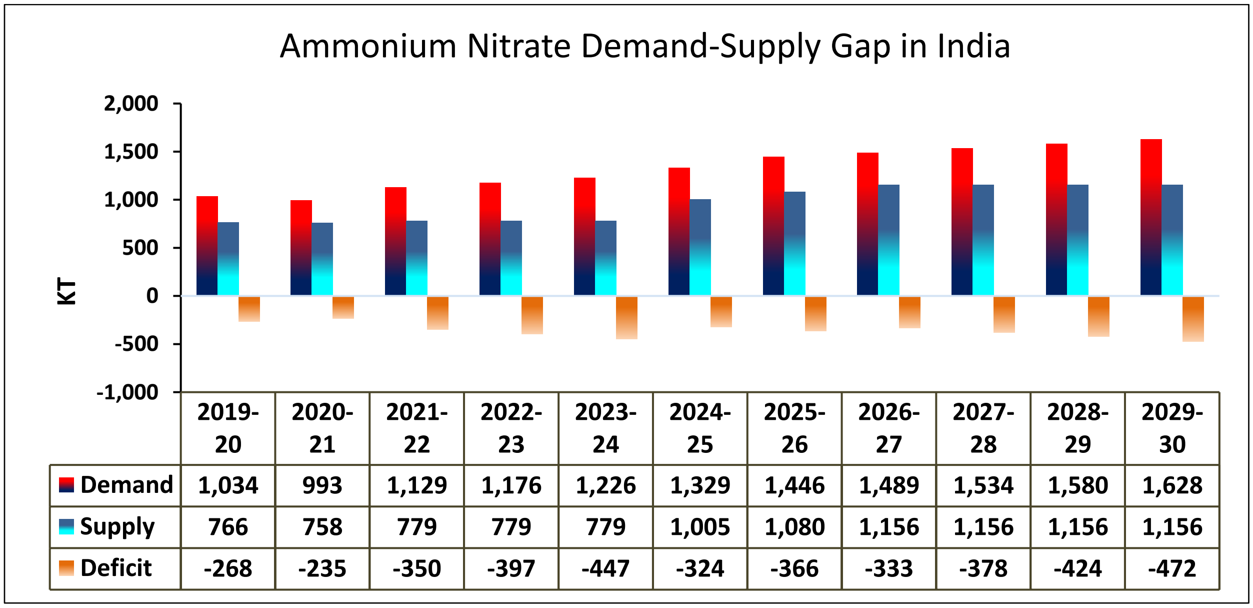
Benefits of Proposed Project

- Enhance domestic production leading to import substitution and **Atmanirbharta**.
- Reduce foreign exchange out flow.
- Generate direct and indirect employment in manufacturing, logistics and other areas.
- Provide quality product of desired grade, reduce premisesity and lead time of imports.
- Reduce overall carbon footprint by eliminating sea transport related to imports.
- Improve company's performance, enabling future investments and adding to country's growth.

2.4 Demand-Supply Gap

Coal mining, cement manufacturing, ore mining and stone quarrying activities require controlled blasting, using Ammonium Nitrate (AN) based explosives. Current demand is higher than domestic production of Ammonium Nitrate (AN). During year 2020-21, domestic production was close to 758,000 MT, whereas demand was 993,000 MT. Gap in demand-supply i.e., about 235,000 MT is met through imports.

Year-wise gap in demand-supply is shown in the graph below *(Source: Industrial Development Services Private Limited, New Delhi):*



	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
🟥 Demand	1,034	993	1,129	1,176	1,226	1,329	1,446	1,489	1,534	1,580	1,628
🟦 Supply	766	758	779	779	779	1,005	1,080	1,156	1,156	1,156	1,156
🟧 Deficit	-268	-235	-350	-397	-447	-324	-366	-333	-378	-424	-472

Figure 1: Demand-Supply Gap in India

Considering growing gap in domestic demand and supply, it is proposed to install Ammonium Nitrate (AN) plant to reduce the gap between demand and supply. This will enhance domestic production and substitute imports.

2.5 Import Versus Indigenous Production

Ammonium Nitrate (AN) is still imported in India due to higher demand than domestic supply. However, after Beirut incident in August-2020, following complications make **domestic production beneficial over imports:**

- Import cost is higher than domestic production.
- Import is permitted to end-users only. End-users cannot import in large quantities.
- Import is permitted at selected ports only. 95% of imports happens at Vishakhapatnam port.
- Ammonium Nitrate (AN) storage is not permitted at Port, hence end-user is required to evacuate the material.
- Anti-dumping duty is applicable on Ammonium Nitrate (AN) imports.

Following graph *(source: Ministry of Commerce, GOI)* shows decline in import quantities after Beirut incident, and due to above-mentioned factors:

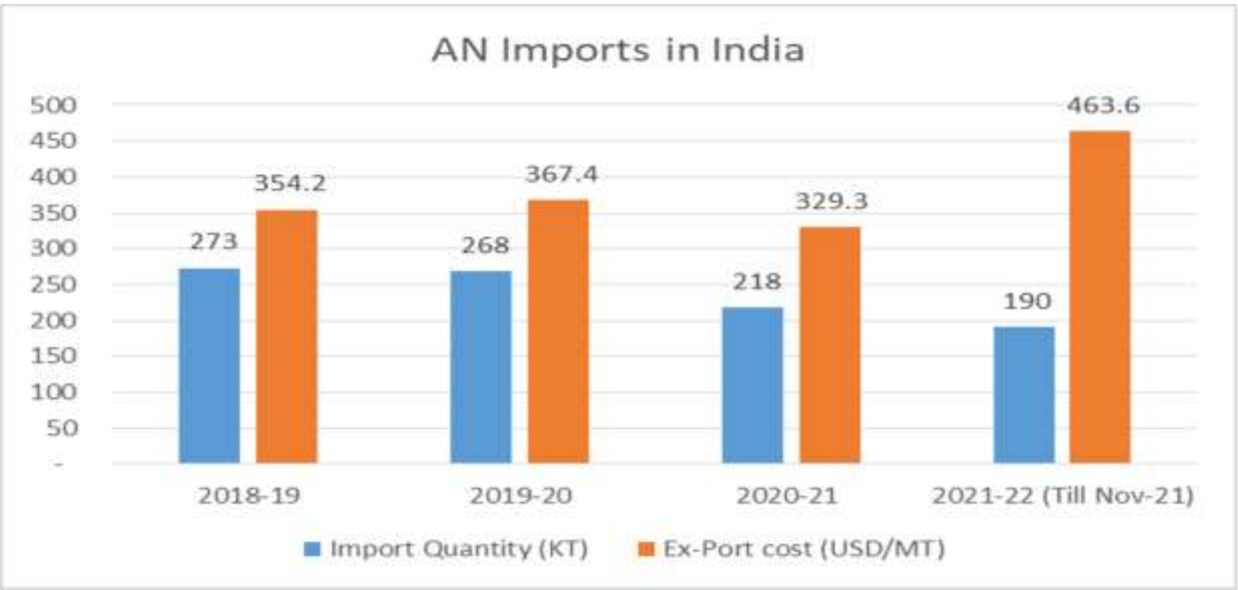


Figure 2: AN Imports in India

2.6 Export Possibility

Ammonium Nitrate (AN) is in demand in neighboring countries in South Asia / Middle East. Such export possibilities may be explored at a later date depending on local demand, market and price conditions.

2.7 Domestic/ Export Markets

Coal mining, cement manufacturing, ore mining and stone quarrying activities require control blasting, thus need Ammonium Nitrate (AN) based explosives. Current demand is higher than domestic production of Ammonium Nitrate (AN). During year 2020-21, domestic production was close to 758,000 MT, whereas demand was 993,000 MT. Gap in demand-supply i.e., about 235,000 MT is met through imports.

Proposed project will focus on supplying Ammonium Nitrate (AN) to domestic markets. Proximity of project location to central parts of the country, which is one of the major consumption area, will facilitate easy sales in the domestic market.

Schematic below shows the proximity of project location to the end-consumers.

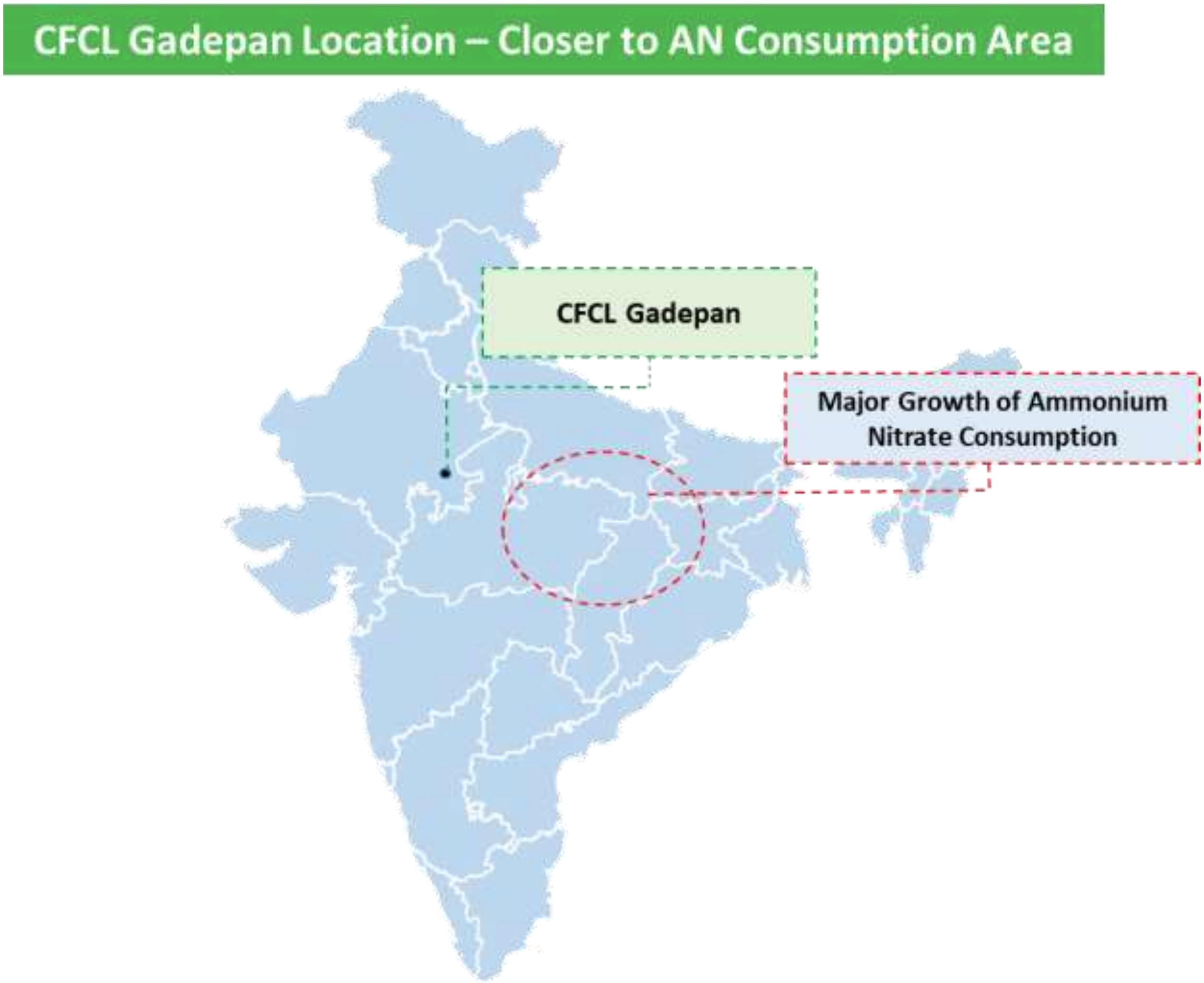


Figure 3: Proximity of Project Location to End User

2.8 Employment Generation (Direct and Indirect) due to the project

Proposed project will provide direct additional employment to about 150 persons (100 permanent + 50 contractual) and in-direct employment in following activities:

- Professionals in engineering offices of licensors and detail engineering companies.
- Transportation of Equipment and Material for project construction.
- Construction phase of the project.
- Transportation of the products.
- Handling of the products at end-user's side.

3 PROJECT DESCRIPTION

Proposed project involves Manufacturing of Technical Ammonium Nitrate (700 MTPD), Weak Nitric Acid (600 MTPD) and Concentrated Nitric Acid (150 MTPD). Proposed plant would be independent project to be installed in the vacant land available in the existing Fertilizer Complex.

3.1 Type of Project including interlinked and interdependent projects if any

There is no interlinked project. The project falls in Schedule Item No. 5(a) Category A as per EIA notification, 2006.

3.2 Location (specific location and project boundary & project lay out) with coordinates

The existing unit is setup at P.O Gadepan, Kota, Rajasthan. The coordinates of proposed plant within existing premises are 25° 9'29.79"N, 76°10'28.06"E. The Google image showing proposed plant area, CFCL premises boundary and 10 km area map are shown in **Figure 4, Figure 5 and 6** respectively. Plant layout is shown in **Figure 7.**

Figure 4: Proposed TAN Plant Area

Figure 5: CFCL Premises Boundary

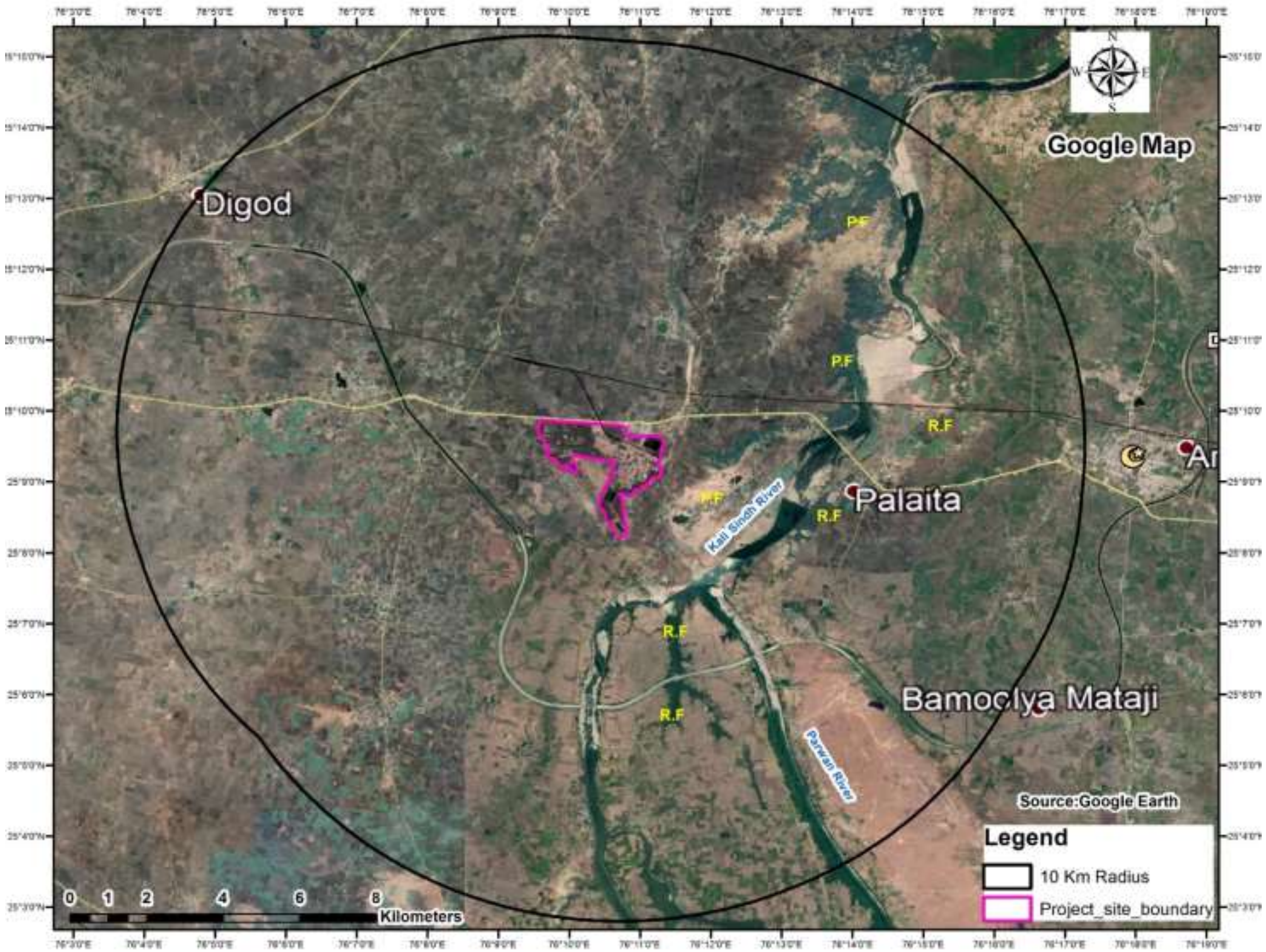


Figure 6: Project Location

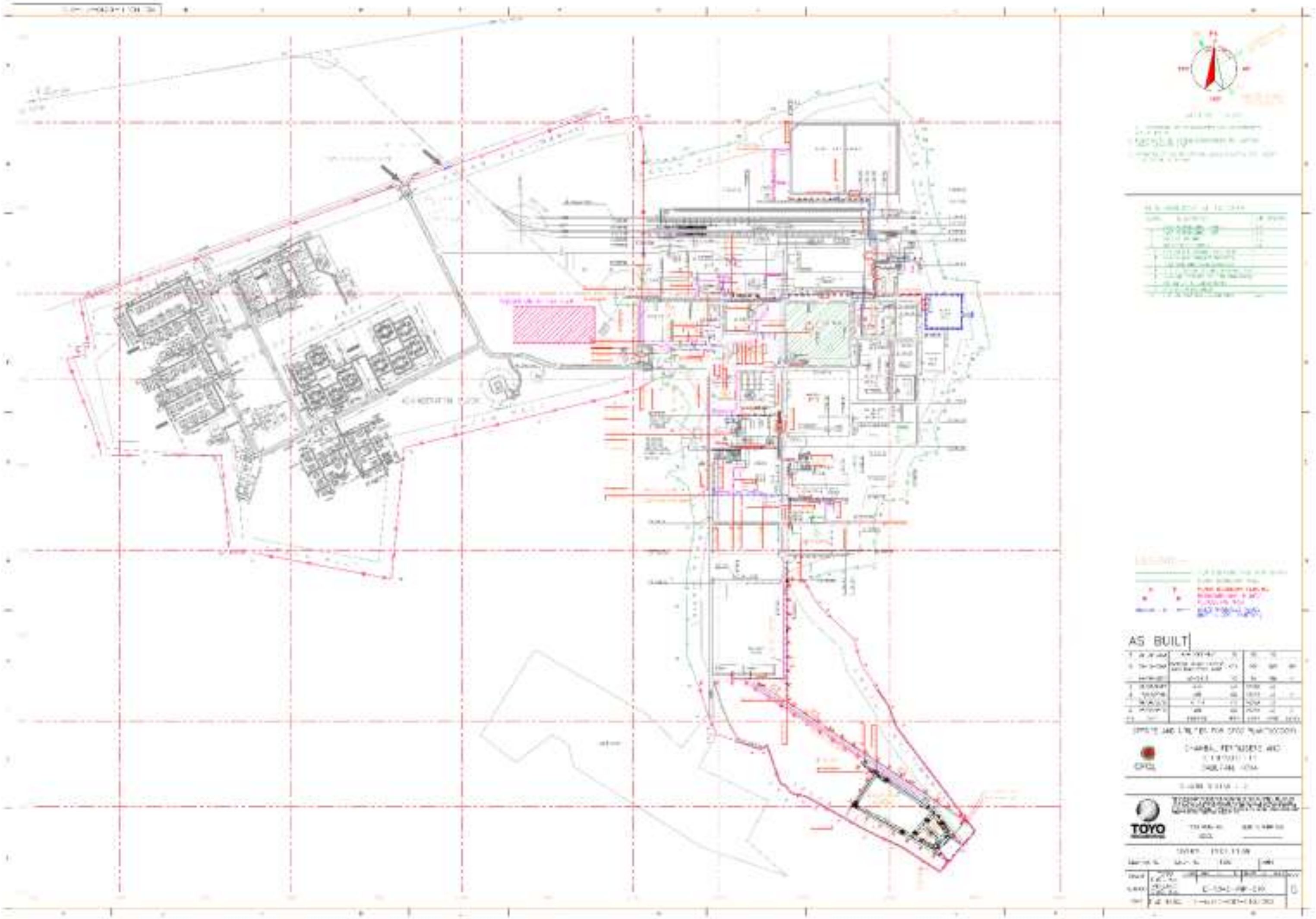


Figure 7: Plant Layout

3.1 Details of alternate sites considered and the basis of selecting the proposed site, particularly the environmental considerations gone into should be highlighted.

Alternative sites have not been considered for proposed project as adequate land and other infrastructure facilities are already available in the existing CFCL premises. Following considerations favored project site at Gadepan.

- Raw material availability.
- Land availability.
- No change in land-use pattern involved.
- No Rehabilitation and Resettlement (R&R) issues involved with the selected site.
- Proximity to the major consumers.
- Better connectivity due to NH-27 and other infrastructure

The project is not likely to cause any significant impact to the ecology of the area as adequate preventive measures will be adopted to control various pollutants within permissible limits.

3.2 Size or Magnitude of Operation

List of Existing and proposed products to be manufactured at the site are mentioned in **Table 7.**

Table 7: Details of Existing and Proposed Products

S. No.	Product	Unit	As per EC granted	Proposed	After Expansion	Remark
1	Weak Nitric Acid (WNA)* as 100wt%	MTPD	0	600	600	**New Products**
2	Technical Ammonium Nitrate (TAN) as 100wt% (Melt / HDAN / LDAN) **	MTPD	0	700	700	
3	Concentrated Nitric Acid (CNA) as 100wt%	MTPD	0	150	150	
4	Ammonia	MTPD	6100	0	6100	**Existing Products-No Change**
5	Urea	MTPD	10800	0	10800	
6	Captive Power	MWH	55	0	55	
7	Steam (HRSG)	TPH	240	0	240	
8	Steam (Boiler)	TPH	320	0	320	

** Weak Nitric Acid (WNA) will be used as raw material for Ammonium Nitrate. Surplus if any will be sold as Weak Nitric Acid (WNA) and/or Concentrated Nitric Acid (CNA).*

*** Ammonium Nitrate (AN) solution will be Prilled to manufacture High-density Ammonium Nitrate (HDAN) and / or Low-density Ammonium Nitrate (LDAN) in quantities as per market demand. It may also be sold as Ammonium Nitrate (AN) Melt. Melt/HDAN/LDAN capacity will be 700 MTPD.*

3.3 Project description with process details (a schematic diagram/ flow chart showing the project layout, components of the project etc. should be given)

1. Proposed Products

a. Weak Nitric Acid (WNA) Process

Capacity: 600 MTPD (100wt% basis)

Weak Nitric Acid (WNA) plant process involves following main reaction steps:

- Ammonia Oxidation
- Oxidation of Nitrous Oxides
- Absorption of Nitrous Gases

Which are further described herein below:

Ammonia Oxidation

Oxidation of ammonia with atmospheric oxygen takes place at the surface of platinum rhodium (Pt/Rh) catalyst gauzes according to the following stoichiometric reactions:

I. $4NH_3 + 5O_2 \longrightarrow 4NO + 6H_2O$; $\Delta HR = -226$ kJ/mol NH_3

II. $4NH_3 + 3O_2 \longrightarrow 2N_2 + 6H_2O$; $\Delta HR = -317$ kJ/mol NH_3

III. $4NH_3 + 4O_2 \longrightarrow 2N_2O + 6H_2O$; $\Delta HR = -276$ kJ/mol NH_3

The process relevant reaction is the reaction according to equation I. which is favored by decreasing pressure and increasing temperature. Conversely, the Pt losses increase with increasing temperature and with increasing specific gas load.

Considering a gauze temperature of approx. 890 °C, a favourable gas flow velocity and the use of the specified gauze alloy as well as an optimized burner load, the oxidation to NO according to equation I. will be approx. 96.5 %.

Oxidation of Nitrous Gases

Nitric oxide (NO) formed according to equation I. will be further oxidized to nitrogen dioxide (NO_2) as follows:

IV. $2NO + O_2 \longrightarrow 2NO_2$; $\Delta HR = -57$ kJ/mol NO

The reaction rate of this reaction is the limiting step of the absorption process. The reaction rate is proportional to the third power of the total pressure.

Absorption of Nitrous Gases

During the absorption of nitrous gases, NO_2 is dissolved in water and nitric acid is formed according to the overall equation:

V. $3NO_2 + H_2O \longrightarrow 2HNO_3 + NO$; ΔHR = -57.4 kJ/mol HNO_3-60%

The chemical reaction of equation V. is proportional to the square of the pressure. The NO formed in equation V. is further oxidized with O2 according to equation IV. And subsequently converted to nitric acid (HNO3) according to equation V. This process continues until almost all the nitrogen oxides have been converted to HNO3.

Weak Nitric Acid (WNA) plant operations involve following steps:

Air Compression

Air required for the process is drawn from the atmosphere under atmospheric conditions through a multi-stage air filter and passes through an inline silencer to reduce noise emissions. Ambient air leaving the air intake silencer is then compressed by the Air Compressor as part of the Nitric Acid Compressor Train to the pressure required for the ammonia oxidation as per equations I, II and III.

The process air, leaving the Air Compressor is split into a primary stream (approx. 80%) as the feed for the ammonia oxidation process and a secondary air stream. The secondary air is cooled against tail gas from the Absorption Tower in Tail Gas Heater before being used as the source of the rest of the oxygen needed for the conversion of the nitrogen oxides to nitric acid as per equation IV and V and for bleaching the final nitric acid product.

Ammonia Evaporation

Liquid ammonia from battery limits is filtered in an ammonia liquid filter before most of the liquid ammonia then flows to the Ammonia Evaporator where the ammonia needed for the process is evaporated.

Gaseous ammonia leaving the Ammonia Evaporator is superheated in the Ammonia Superheater installed on top of the Ammonia Evaporator to prevent carryover of ammonia droplets to the Ammonia Burner. After leaving the Ammonia Superheater, the gaseous ammonia is filtered by passing through an ammonia gas filter. Impurities in the ammonia liquid stream such as water and oil are accumulated in the liquid phase in the Ammonia Evaporator. In order to keep the concentration of water and oil at a low level a part of the liquid in the Ammonia Evaporator is continuously or discontinuously drained to an ammonia stripper where remaining ammonia is evaporated.

While the ammonia gas is returned to the process upstream of the Ammonia Superheater, the liquid phase, mainly consisting of water and oil, is drained for disposal.

Ammonia Oxidation

The superheated ammonia gas leaving the ammonia gas filter and the primary air coming from the Air Compressor are fed to an ammonia air mixer where both streams are uniformly mixed before entering the Ammonia Burner. In the Ammonia Burner, the exothermic ammonia oxidation reactions as per equation I, II and III take place on platinum-rhodium (Pt/Rh) catalyst gauzes at a temperature of about 890 °C. The gaseous combustion product downstream of the Pt-Rh catalyst gauzes, referred to here as NO gas, consists mainly of nitrogen monoxide NO, gaseous water H2O, nitrogen N2, oxygen O2 as well as a small quantity of nitrous oxide N2O.

NO Gas Cooling

The hot NO gas passes through the Process Gas Cooler superheater coils and evaporator coils where the heat is utilized to generate medium pressure (MP) steam.

The NO gas leaving the Process Gas Cooler enters the Tail Gas Heater for further cooling down and Economizer where further process gas thermal energy and oxidation heat are used to heat up boiler feed water. Afterwards, the NO gas enters Tail Gas Heater 3 where further cooling takes place. NO gas leaving Tail Gas Heater 3 enters the Boiler Feed Water Preheater installed on top of Cooler Condenser, where it is cooled by means of demineralized water. This item is part of the heat recovery system of the nitric acid plant in which the demineralized water is heated up. In the Boiler Feed Water Preheater, acid condensation is initiated in a controlled way, allowing some useful heat to be recovered from the heat of condensation and avoiding corrosion due to acid re-boiling phenomena. The final cooling of NO gas in the medium pressure section of the nitric acid plant takes place on the shell side of Cooler Condenser. The nitric acid formed in Cooler Condenser is pumped to a tray in the Absorption Tower with a corresponding concentration.

NO Gas Compression and Re-cooling

After leaving the Cooler Condenser, the cold NO gas is mixed with the secondary air stream leaving the Bleaching Tower to increase the oxygen content in the NO gas to facilitate further oxidation as per equation IV on one hand and to recycle the nitrogen oxides carried by the secondary air after bleaching on the other hand. The mixed stream passes through the NO gas separator where weak nitric acid droplets carried over from Cooler Condenser are separated from the NO gas stream before the NO gas enters the NO Compressor, which is part of the Nitric Acid Compressor Train.

The NO gas entering the NO Compressor is compressed. The NO gas leaving the NO Compressor is fed to the Tail Gas Heater where it is cooled against cold tail gas from the absorption section. Afterwards the NO gas enters Cooler Condenser for further cooling. Weak nitric acid formed in Cooler Condenser is fed from Cooler Condenser another condenser and subsequently to the Absorption Tower.

NOx Gas Absorption

The gas leaving Cooler Condenser is fed to the bottom part of the Absorption Tower and passes through the absorption tower trays on its way to the top of the Absorption Tower in counter current flow to the process water feed flowing down to the bottom of the Absorption Tower. While the NO gas is bubbling through the process water the exothermic reactions as per equation IV and V takes place and nitric acid is formed.

The heat of reaction and absorption is removed from the trays by water cooled coils located directly on the trays.

The unbleached nitric acid leaving the Absorption Tower is fed to the Bleaching Tower where the raw nitric acid flows downwards through the packed bed in counter current flow to the secondary air flowing upwards. During this process the raw nitric acid flowing downwards is bleached, i.e., dissolved nitrogen oxides are stripped out from the raw nitric acid and pass into the upwardly flowing secondary air.

The final nitric acid product flows from the sump of Bleaching Tower to battery limit or storage is given below in **Figure 8.**

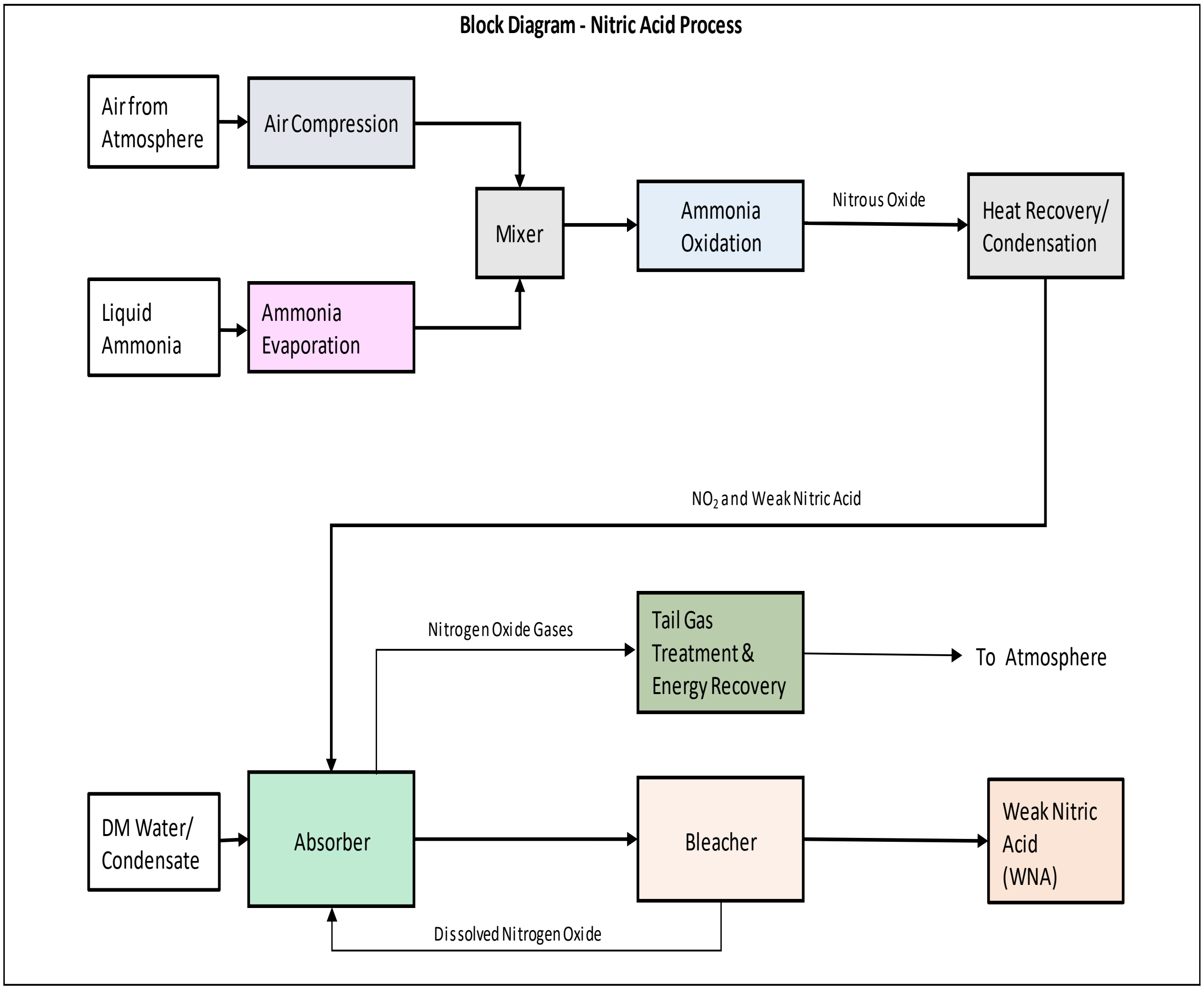


Figure 8: Block Diagram of Nitric Acid Process

b. Ammonium Nitrate (AN) Plants

Product:	Technical Ammonium Nitrate (TAN)
Capacity:	700 MTPD (100wt% basis)

Salable end-products shall be as under:

High Density Ammonium Nitrate (HDAN) – 700 MTPD
Low Density Ammonium Nitrate (LDAN) – 700 MTPD

Ammonium Nitrate (AN) solution will be used as raw material for making High-density Ammonium Nitrate (HDAN) and / or Low-density Ammonium Nitrate (LDAN) and the balance if any shall be sold as Ammonium Nitrate (AN) Melt. HDAN and / or LDAN quantities will be manufactured as per market demand. Melt/HDAN/LDAN total will be 700 MTPD.

Process description for the preparation of Technical Ammonium Nitrate can be divided in two parts:

- Ammonium nitrate solution preparation (wet part)
- Prilling, drying and cooling the product (solid part)

Ammonium nitrate is obtained by the reaction between the gaseous ammonia and the nitric acid as per the following reaction:

$NH3 + HNO3 \rightarrow NH_4NO_3 + Heat$

This reaction is exothermic. If the temperature goes above 200°C and at under certain unfavorable conditions like acidic pH, the ammonium nitrate decomposes violently per the below shown reactions:

$NH_4NO_3 \rightarrow N2O + 2\ H2O + Heat$

$2\ NH_4NO_3 \rightarrow 2\ N2 + O2 + 4\ H2O + Heat$

Ammonium nitrate solution preparation (wet part)

The wet part consists on the preparation of an ammonium nitrate concentrated solution from Ammonia and Nitric Acid as raw materials. We can divide this part in two sections:

- Reaction of reactants in reactor
- Concentration of the diluted AN solution

Reaction of reactants in reactor

Liquid ammonia is evaporated / superheated and fed to the Reactor where it reacts with the nitric acid, to form ammonium nitrate liquor. The pH of the ammonium nitrate solution obtained in the reactor controls the feed of ammonia gas to the Reactor. This flash produces process steam and concentrated solution. Ammonium Nitrate solution (ANS) from the bottom of separator flows to a Tank. Mist of ammonium Nitrate is removed from Process steam in a scrubber by scrubbing with weak AN solution. The generated process steam is used to heat the ammonia gas.

AN Liquor Concentration

88 – 92 % Ammonium nitrate solution is pumped to the tube side of Evaporator. Steam is fed to the shell of evaporator to supply necessary heat to concentrate the solution. The concentrated AN solution (97-99.8% AN) leaves the bottom of the Evaporator and either collected in the intermediate tank or goes for prilling depending on the grade of Technical Ammonium Nitrate. In case of former, the tank has internal coils, which are fed with LP steam to increase the solution temperature. The concentrated AN solution/melt is pumped to the upper part of the prilling tower.

The Ammonium Nitrate Melt product flows is given below in **Figure 9.**

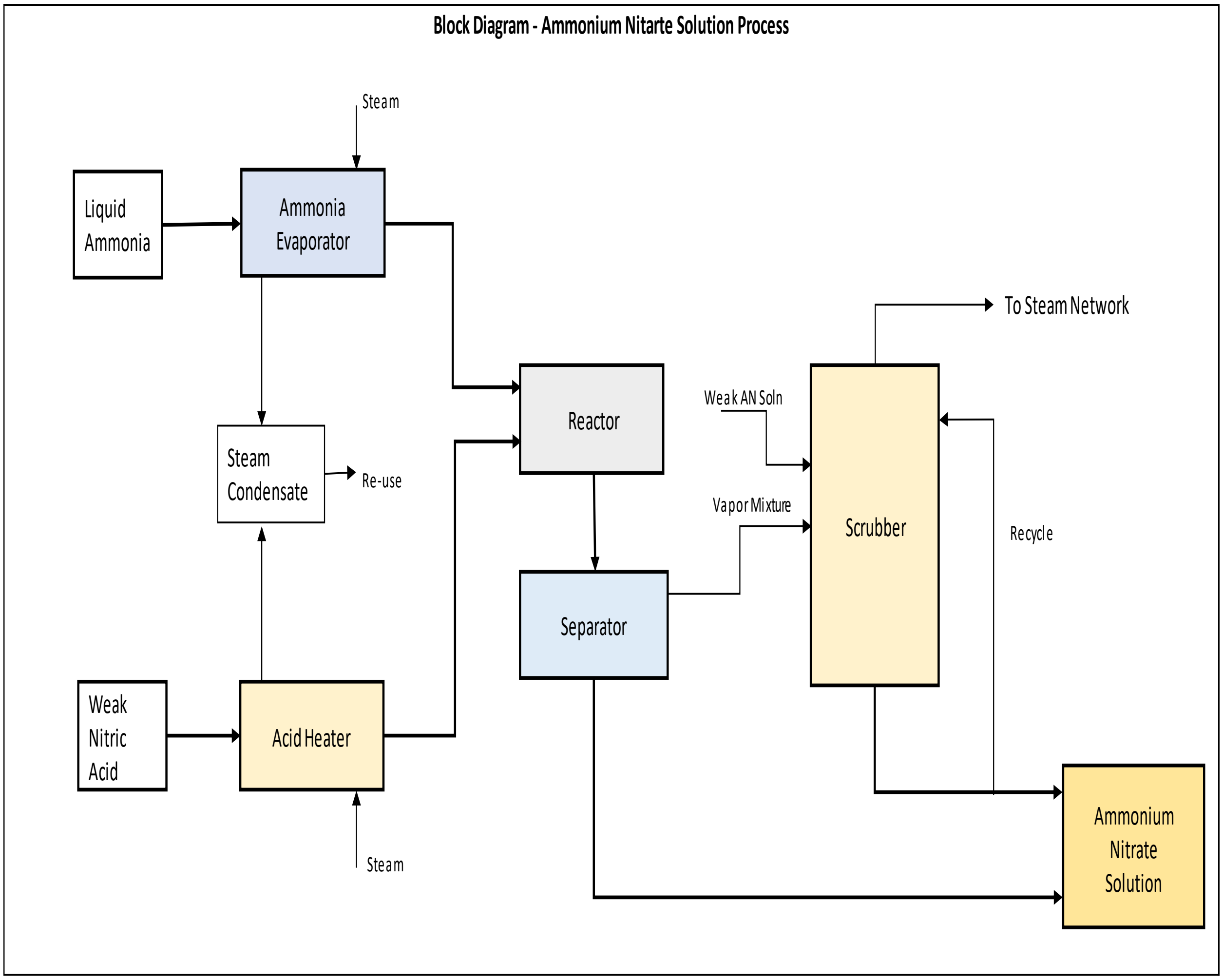


Figure 9: Block Diagram of Ammonium Nitrate Melt Process

Prilling, drying and cooling the product (solid part)

This section is generally divided in three parts:

- Prilling of Ammonium Nitrate Solution
- Drying
- Screening, Cooling and Coating of the Product

Prilling of Ammonium Nitrate Solution (to manufacture High-Density Ammonium Nitrate)

The hot concentrated melt is prilled in prilling section of the plants. Ammonium nitrate is formed into droplets by a prilling bucket or spray nozzles within a tall tower (prilling tower). Suitable additives are added as per requirement. Droplets fall by gravity and get cooled & solidified against a counter-current air stream. Technical Ammonium Nitrate (AN) prills are collected on the belt conveyors located at the bottom of the prilling tower. Ammonium nitrate prills collected at the bottom of prilling tower are sent by belt conveyors to the drying section.

Air stream leaving the top of the prilling tower is scrubbed and cooled in the prilling scrubber by means of acidic weak AN solution, which is partially recycled to recover most of the AN content in the air. Balance clean air is sent to the vent stack.

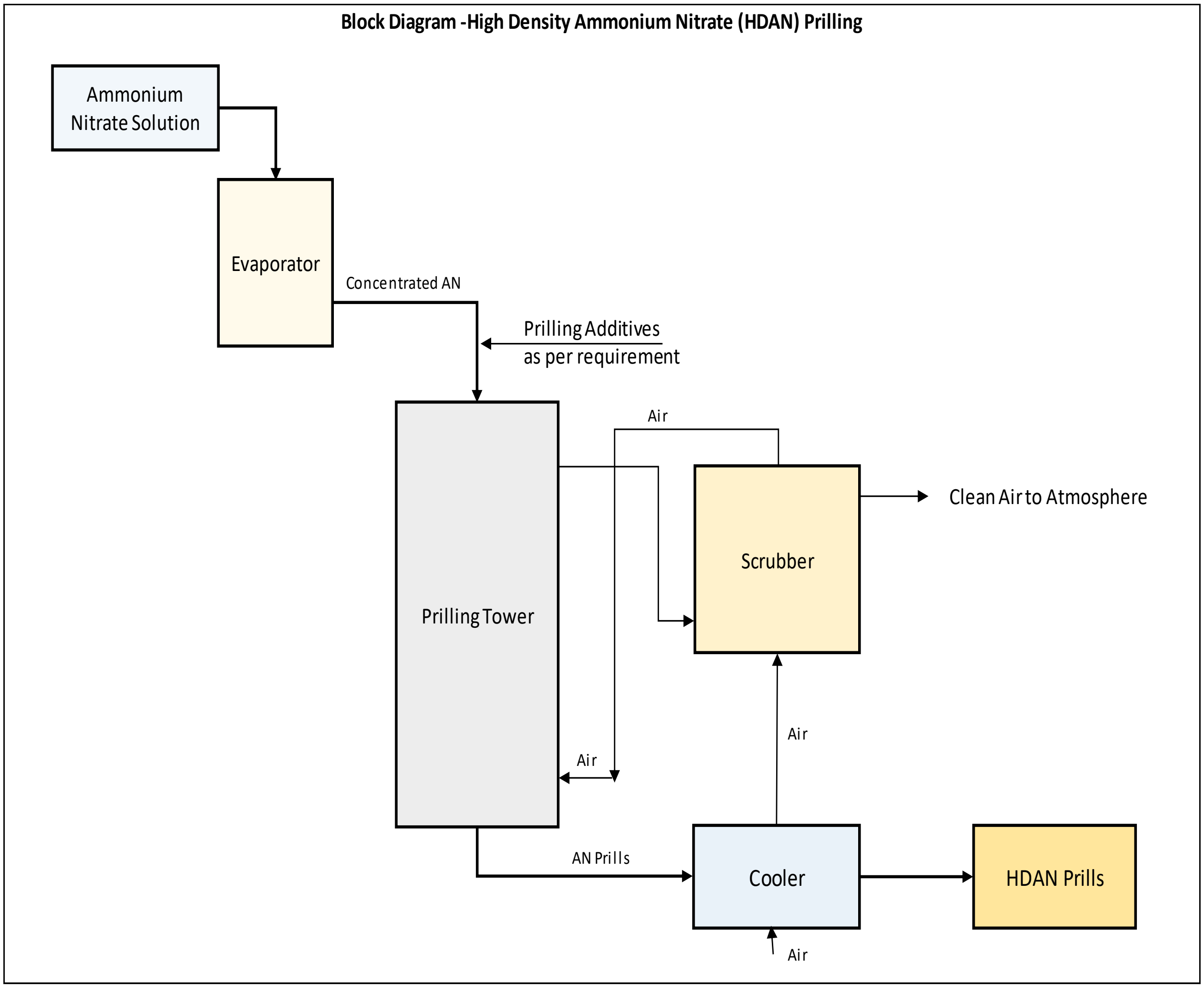


Figure 10: Block Diagram of High-Density Ammonium Nitrate Prilling Process

Prilling of Ammonium Nitrate Solution (to manufacture Low-Density Ammonium Nitrate)

Prilling process to manufacturer Low-density Ammonium Nitrate (LDAN) prills is practically same as for High-density Ammonium Nitrate (HDAN) prills, elaborated above. Only difference is in Ammonium Nitrate Solution concentration at prilling section top and treatment to prilled product at prilling section top.

Evaporator is not required for LDAN prilling. Prilled product is dried to achieve porosity in the prills, prior to cooling and subsequently coated.

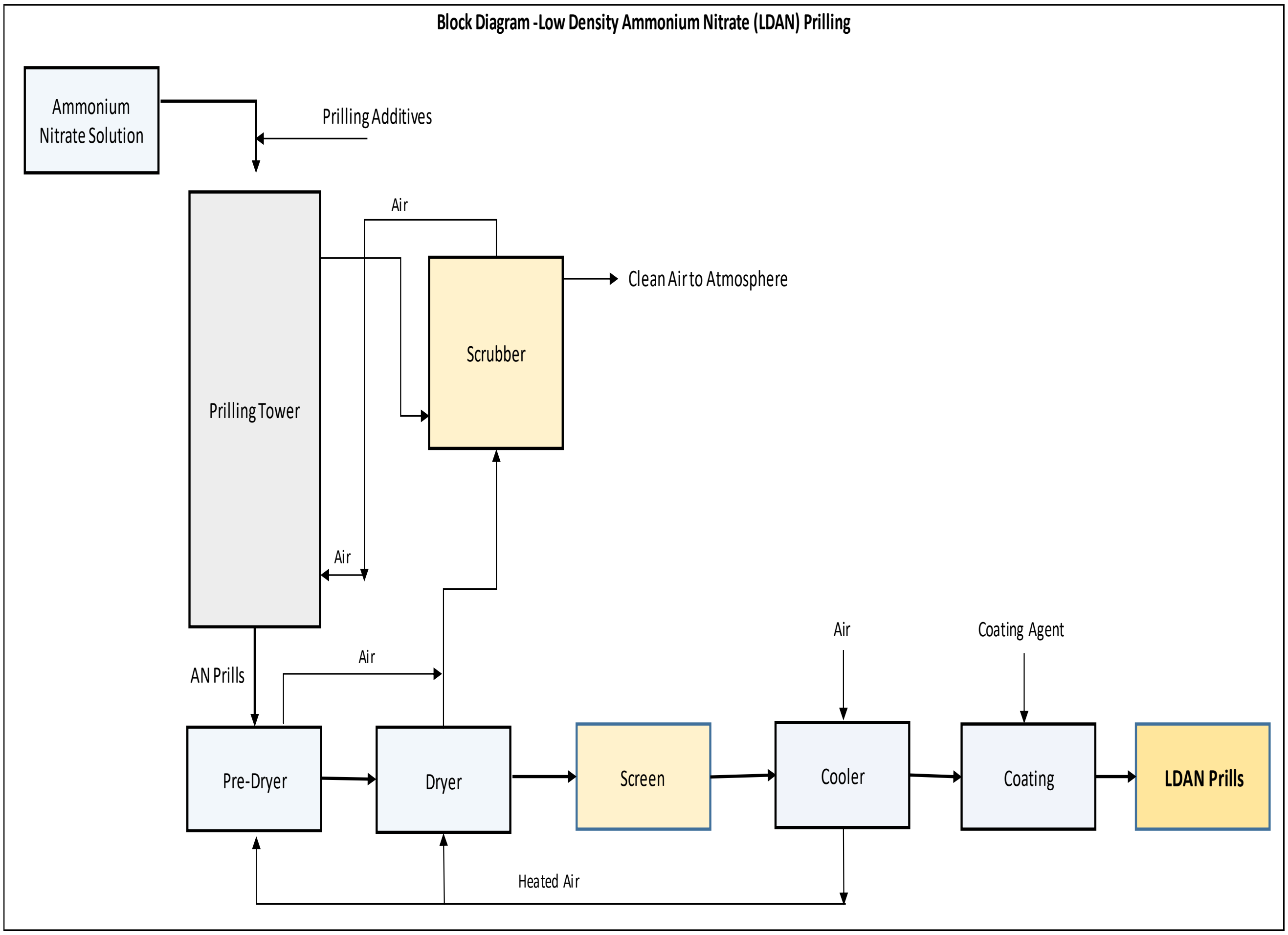


Figure 11: Block Diagram of Low-Density Ammonium Nitrate Prilling Process

Drying of the Prills

The drying of the prills involves slow vaporization of most of the water of the prills allowing a progressive drying which does not damage the prills and gives hardness required to the product.

The exhausted hot air loaded with dust leaving the dryer drums is sucked into the scrubbers by means of blower. The washing of the air is done in the scrubber with weak AN solution. Clean air is then vented. From the dryer, the prills are sent to the screens through belt conveyors.

Screening, Cooling and Coating of the Product

Oversized and fines prills from screen are recycled, to the Wet section to be dissolved with the ammonium nitrate solution. The on-size product is cooled in the fluidized bed cooler against air-conditioned air or in the bulk flow cooler against chilled water.

Depending upon the product application, prills are sent to coating drum after cooling and sprayed on the outer surface with a coating agent to attain the anti-caking characteristics. Subsequently the coated/un-coated product is sent to storage/ Bagging Plant through belt conveyor for conditioning, Bagging or storage in warehouse post bagging.

Product Handling & Bagging

The coated/un-coated prills are sent to the bin/hopper in the Bagging plant, where they are packed in HDPE bags (with LDPE liner where applicable) for selling. Bagging machines of sufficient capacity shall be installed to bag entire production.

Loading and Dispatch

To load these bags on trucks, truck loaders shall be provided to load bags directly on trucks. During the non- availability of trucks, the same truck loader can be moved to other side for loading the bags on pallets with same work force. On the availability of trucks, truck loader shall be diverted to truck end again. Bags from pallets also to be put on truck loader for dispatch. Bagged storage area will be created to store bagged product during the non-availability of trucks.

AN Melt Dispatch

Facilities shall be provided to load 84- 86 % concentrated AN melt by installing AN melt storage and facility to load road tankers.

c. Concentrated Nitric Acid (CNA) Process

Product:	Concentrated Nitric Acid (CNA)
Capacity:	150 MTPD (100wt% basis)

Concentrated Nitric Acid (CNA) plant process involves following main steps:

- Extractive Distillation
- Magnesium Nitrate recovery and recycling
- Scrubbing of vent gases

Surplus Weak Nitric Acid (WNA) is of 60% concentration. Such weak nitric acid will be concentrated to 98-99% concentration, by means of extractive distillation based on Magnesium Nitrate route.

Weak Nitric Acid (WNA) is feed to a distillation column. Column reboiler is supplied with steam. Vapors travelling across the column causes more vaporization. Vapors at the top of column are condensed as Concentrated Nitric Acid (CNA). Part is recycled to column as reflux and remaining is taken to product storage through a bleaching column.

Bottom stream of the column contains minor quantity of HNO3 and major weak Magnesium Nitrate. This stream is taken into a vacuum evaporator. Concentrated Magnesium Nitrate stream is recycled to Distillation column.

NOx containing gases from bleaching unit and vacuum evaporator are taken into scrubber, where these are absorbed into process condensate under pressure conditions. Clean air is vented to atmosphere. Weak acidic stream from scrubber is recycled into the process.

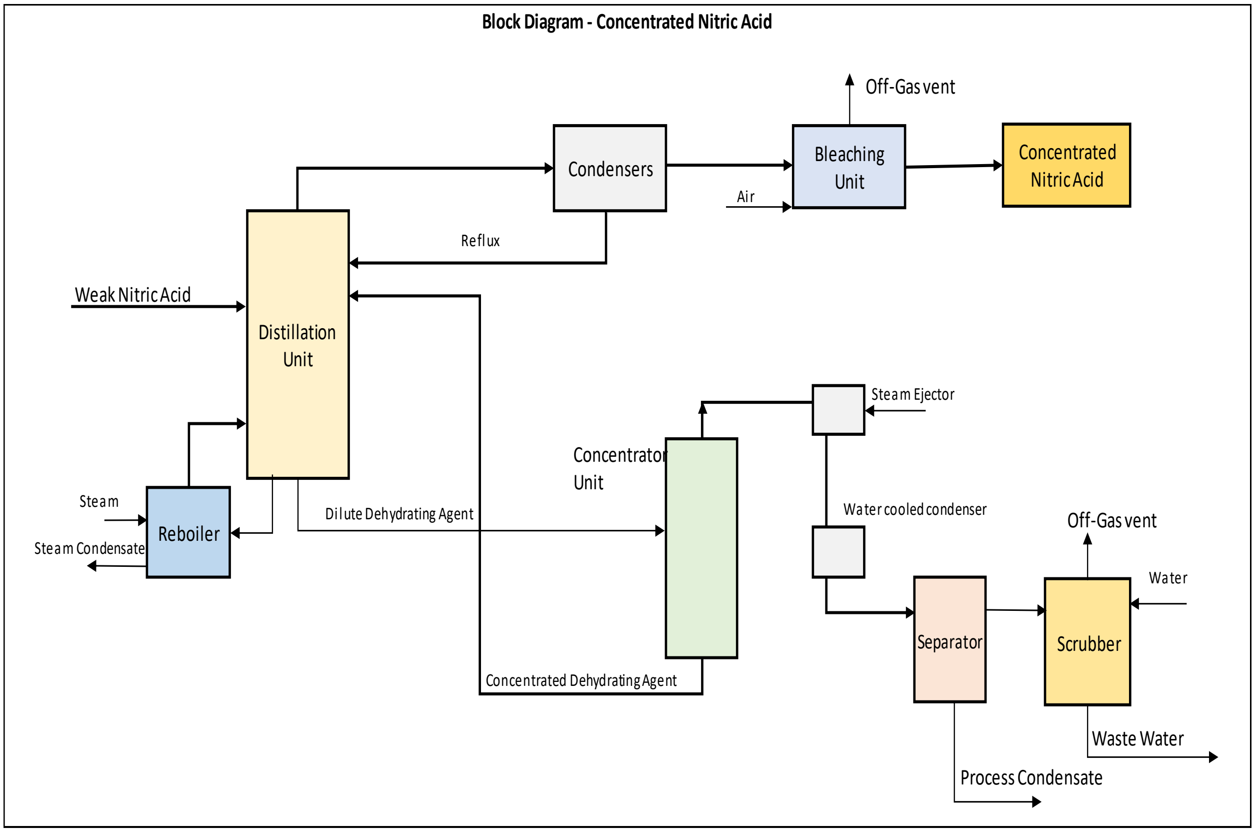


Figure 12: Block Diagram of Concentrated Nitric Acid Process

Other Facilities Proposed

Proposed project shall have following other facilities:

- Control room (common to all plants)
- Electrical sub-station (common to all plants)
- Cooling towers and associated systems (like pumping system, chlorination system, side stream filtration and blowdown/backwash pit with pumping arrangement)
- Instrument air compressor and dryers (including storage vessels)
- Nitrogen generation facilities and liquid nitrogen storage facilities
- Utility systems (like drinking water, plant air, utility water, HVACs etc.)
- Weak Nitric Acid (WNA) storage tanks (2 x 2000 MT) with unloading/loading facilities
- Ammonium Nitrate (AN) solution storage tanks (2 x 50MT) with unloading/loading facilities
- Fresh water storage tank (capacity will be firmed up at design stage)
- DM water storage tank (capacity will be firmed up at design stage)
- Fire-fighting system (as per plant requirements)
- Emergency Diesel Generator (EDG)
- Liquid effluent handling facilities
- Sewage handling facilities
- Surface drains
- Boundary wall

- Weight bridge
- Truck parking facilities
- Facilities like store, canteen, rest rooms, laboratory and vehicle parking etc.

2. Existing Products

a) Gadepan Plant- I (G-I)

i. Ammonia-I

Ammonia-I Plant is a state of art hi-tech complex based on Natural Gas feed stock and designed by M/s. Haldor Topsoe of Denmark.

Following process steps are involved in the manufacturing of liquid ammonia:

- Desulphurisation of Feed Stock
- Steam Reforming/Secondary Reforming
- Reforming Heat Exchanger
- Gas Purification ion (Shift Conversion and CO2 Removal (GV Process))
- Ammonia Synthesis & Refrigeration
- Ammonia Absorption and Condensate Recovery

Desulphurisation of Feed Stock

Natural Gas is fed to De-sulphurization unit where the sulphur present in Natural Gas (Around 10 ppm as H2S by volume) is converted into Hydrogen Sulphides in presence of hydrogen rich gas & hydrogen sulphides formed is absorbed by zinc oxide in ZnO Absorber as per the following reaction. The final De-sulphurized feedstock contains less than 0.1 ppm sulphur.

$$RSH + H_2 \rightarrow RH + H_2S$$

$$C_4H_4S + 4H_2 \rightarrow C_4H_{10} + H_2S$$

$$ZnO + H_2S \rightarrow ZnS + H_2O$$

Steam Reforming/ Secondary Reforming

The Desulphurised feed gas is mixed with Process Steam to achieve optimum Steam to Carbon ratio and heated in the convection section of Primary Reformer. The mixture then passes through vertical Primary Reformer tubes containing nickel-based catalyst. Since the reforming reaction is endothermic, necessary heat is provided in the furnace by burning fuel. The Primary Reformer furnace is designed to achieve maximum thermal efficiency and uniform heat distribution. Maximum heat is recovered from the flue gases in the convective section of Primary Reformer to pre-heat mixed feed (gas/steam mixture), Process air for Secondary Reformer, Combustion air and to superheat the High Pressure steam. Primary reforming reaction is given below:

$$C_nH_{2n+2} + 2H_2O \rightarrow C_{n-1}H_{2n} + CO_2 + 3H_2 - \text{HEAT}$$

$$CH_4 + H_2O \rightarrow CO + 3H_2 - \text{HEAT}$$

$$CO + H_2O \rightarrow CO_2 + H_2 - \text{HEAT}$$

$$CH_4 + 2H_2O \rightarrow CO_2 + 4H_2 - \text{HEAT}$$

The partially reformed gas from Primary Reformer is mixed with Process air and the mixture flows through a bed of nickel based catalyst in the Secondary Reformer. Process Air Compressor supplies process Air to Secondary Reformer. The quantity of air is controlled to provide nitrogen in the required proportion for the formation of ammonia. The process gas from the Secondary Reformer is routed to a Waste Heat Boiler to generate high-pressure steam.

Reforming Heat Exchanger

Primary and Secondary Reformer supplemented by Reforming Heat Exchanger in parallel. Reforming Heat Exchanger uses high-grade waste heat at the exit of Secondary Reformer and produces necessary reformed gas required to support production of additional Ammonia and CO_2.

CO Shift Conversion

Gas leaving the Waste Heat Boiler system enters the High Temperature CO Shift converter (HTS) charged with Iron-oxide catalyst. Here the CO content is converted to CO2. Since the reaction is exothermic, the outlet temperature rises. This gas is then cooled down in another Waste Heat Boiler by producing HP Steam. Finally the gas is cooled in BFW Pre-heater before entering Low Temperature CO Shift Converter (LTS). In LTS Converter, CO is further converted to CO_2 by reaction over a Copper based Catalyst. This reaction is also exothermic, which is given below:

$$CO + H_2O \rightarrow CO_2 + H_2 + Heat$$

(Carbon Mono-oxide) (Water) (Carbon Di-oxide) (Hydrogen)

Gas is then further cooled in two BFW Pre-heaters. Then it enters the Re-boiler of CO_2 removal system after the removal of process condensate in a separator. This process condensate is sent to Process Condensate treatment section.

CO2 Removal Section (GV Process)

GV is the Process Licensor of CO_2 Removal Process and in this process Carbon Dioxide is removed by absorption in Hot Potassium Carbonate solution.

The process gas from the Re-boiler is cooled by exchanging heat in a DMW Preheater. Then it enters the CO_2 Absorber where its CO_2 content is brought down to the level of around 500 ppm. The absorber is a packed column having a combination of structured and random packings. The Hot Potash solution is introduced into the Absorber at two places, the lean solution at the top bed and the semi-lean at the middle-bed. The CO_2 rich solution from the Absorber bottom is depressurized through a Hydraulic Turbine with a power recovery system, before it is discharged to the top of the Regenerator, where the CO_2 flashes off. The heat for regeneration is supplied to the regenerator partly from the Re-boiler and partly from flashed steam/live steam. The regenerated solution is then pumped to the CO_2 Absorber by Lean & Semi-lean solution circulation pump. Product CO_2 from the CO_2 regenerators is sent to Urea Plant.

Methanation

The gas from CO_2 Absorber is pre-heated by heat exchange with the outlet gas from the Methanator in a Gas/Gas exchanger. The small quantities of CO and CO_2 in the gas are converted to methane by reaction with hydrogen over a nickel-based catalyst. This reaction, which is given below is exothermic and the heat is used for heating the feed gas. The gas from Gas/ Gas Exchanger outlet is cooled in a final gas cooler and sent to the suction of Synthesis Gas Compressor:

$$CO_2 + 4\,H_2 \rightarrow CH_4 + 2H_2O + \text{Heat}$$

(Carbon Di-oxide) (Hydrogen) (Methane) (Water)

$$CO + 3\,H_2 \rightarrow CH_4 + H_2O + \text{Heat}$$

(Carbon Mono-oxide) … (Hydrogen) (Methane) ….. (Water)

Ammonia Synthesis & Refrigeration

The synthesis gas, which has hydrogen & nitrogen in a volumetric ratio of 3:1 and some inerts, is compressed to synthesis loop pressure by Synthesis Gas Compressor and is introduced into the synthesis loop from where it goes to series of Ammonia Converters (containing iron based catalyst) to get maximum ammonia conversion along with re-circulating gas. Ammonia Converter synthesis reaction is given below:

$$N_2 + 3\,H_2 \rightarrow 2\,NH_3 + \text{Heat}$$

Nitrogen) (Hydrogen) (Ammonia)

The converter effluent gas is cooled in a Waste Heat Boiler after both ammonia converters for generating HP Steam. This is further cooled in a BFW pre-heater and then its further cooled in BFW Preheater and then in a hot heat exchanger. It is then cooled in water cooler & chillers. The condensed ammonia is separated from the circulating gas in Ammonia Separator. From this Ammonia Separator, separated hot ammonia is sent directly to Urea Plant and cold ammonia can be sent to Atmospheric Ammonia Storage tank.

Ammonia Refrigeration system consists of centrifugal Refrigeration compressor along with condenser.

Ammonia Absorption and Condensate Recovery

Purge gases from the synthesis loop are fed to PGRU for hydrogen recovery. Letdown & Inert gases from the Synthesis loop are fed to an Absorber where ammonia is absorbed in the circulating water. The ammonia free gas is then sent as fuel to Primary Reformer.

The Ammonical water is treated in a distillation Column to strip out free ammonia, which is condensed and sent to ammonia accumulator in the refrigeration system. The process condensate and CO2 absorption section condensate are treated in a process condensate stripper to remove ammonia, CO2 and methanol etc. The purified condensate is sent to Offsite and Utilities facilities for reuse as boiler feed water after polishing.
Block Diagram showing Ammonia-I Plant manufacturing process is given below in **Figure 13**

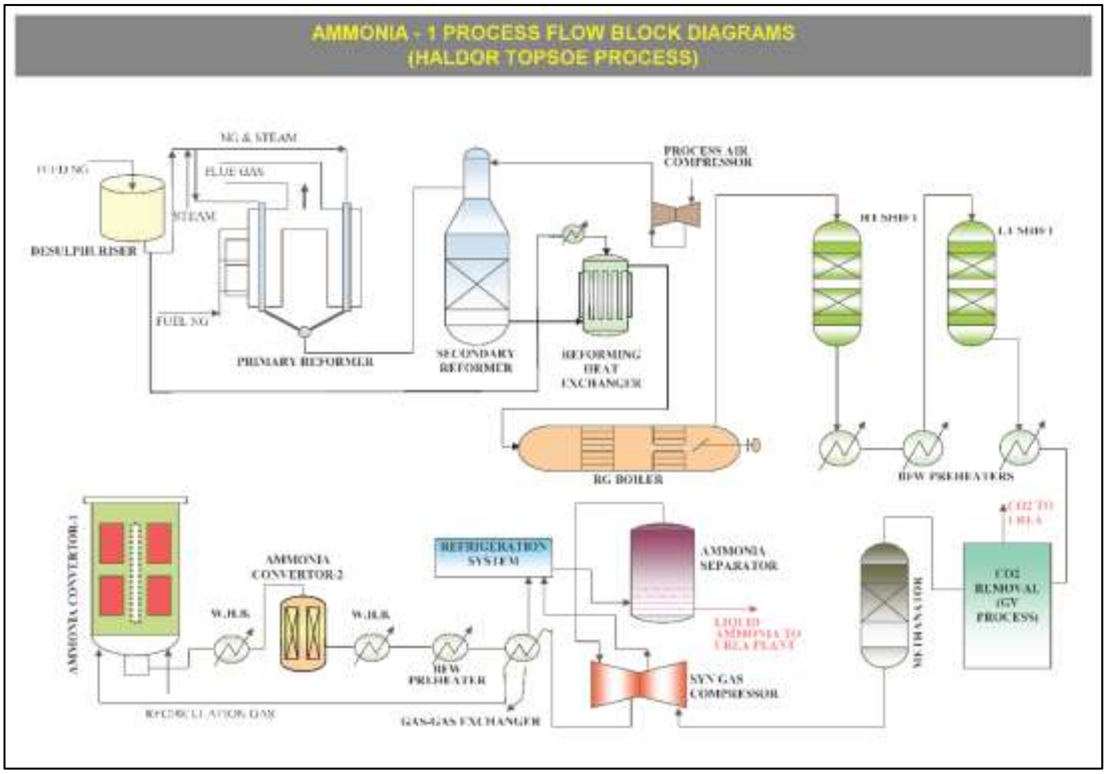


Figure 13: Block Diagram showing Ammonia-I Plant Manufacturing Process

ii. Urea-I

Urea-I plant is based on Snamprogetti, Italy process and has two streams with common Prilling Tower and Process Condensate Treatment Sections.

The Urea production process involves the following steps:

- Urea Synthesis
- Urea Purification
- Urea concentration
- Urea Prilling
- Process Condensate Treatment

Urea Synthesis

Synthesis of Urea is carried out at high pressure of 156 Kg/Cm²g and temperature of about 190°C in a carbon steel Rector with SS 316L modified liner. The liquid ammonia coming directly from the Ammonia Plant is collected in the Ammonia Receiver. From the receiver, it is pumped by means of a pump and fed to the Urea Reactor. The carbon dioxide is also compressed to Synthesis pressure by a centrifugal compressor and fed to the Reactor. The small quantity of air is added into carbon dioxide for Passivation of the stainless steel surfaces and thus protects the equipments form corrosion.

Exothermic reaction between Liquid ammonia & gaseous carbon dioxide in Urea Reactor is given below:

a) Carbamate Formation

$2\ NH_3 \quad + \quad CO_2\ NH_2\ COO\ NH_4 \quad + \ Heat$

(Ammonia) (Carbon Di-oxide) (Ammonium Carbamate)

b) Dehydration

$NH_2COONH_4 \quad + \quad NH_2CONH_2 \quad + H_2O \quad - \quad Heat$

(Ammonium Carbamate) (Urea) (Water)

The reaction products from the Reactor flow to the steam heated falling film type Stripper operating at Synthesis pressure. The mixture is heated as it flows down and the carbamate is decomposed by the stripping action. The carbamate decomposition heat is supplied by steam on the shell side. The overhead gases from the stripper flow to the carbamate condenser along with recycle carbamate solution from down stream, where these are condensed and recycled back to Reactor. Condensing the gases at high-pressure results in low pressure steam generation in carbamate condenser, which is utilized in the process.

Urea Purification

Urea purification takes place in two pressure stages i.e. MP pre-decomposition (proposed to be installed in revamp case) and MP Decomposition at operating pressure of 17 Kg/Cm^2g and LP Decomposition at operating pressure of 3 Kg/Cm^2g. When solution is let down from high pressure to lower pressure, gaseous ammonia & carbon dioxide are generated. These gaseous mixtures are condensed/ absorbed at respective pressures and recovered Carbamate solution is recycled back to the Reactor.

Urea Concentration Section

Urea solution leaving the LP Decomposer shall be sent to first Vacuum Concentrator operating at 0.3 Kg/cm^2a pressure.

The gases leaving from pre-concentrator & 1st Vacuum Separator are removed first vacuum system. Final concentration of 99.7 % is achieved in the second vacuum concentrator operating at 0.03 Kg/cm^2a pressure. The gases leaving the top separator are removed by the second vacuum system. Water vapors from the concentration section are condensed in cooling water Surface Condensers and recovered condensate, which contains urea mist, CO_2 and Ammonia is sent to Process Condensate treatment section.

Urea Prilling

The molten Urea solution after final concentration in vacuum section is fed to the Prilling bucket by means of a Urea Melt pump. The urea coming out from the rotating prill bucket encounters cold airflow in a natural draft Prilling tower, which causes its solidification. The product urea prills falling to the bottom of the Prilling tower are collected through a rotary scrapper and are sent to Bagging Plant / Silo.

Process Condensate Treatment

The process condensate containing small amount of CO2, Ammonia and Urea coming out of vacuum condensers is collected in a buffer tank. The solution from this tank is fed to Process Condensate Stripper to strip ammonia and CO2. The solution drawn from an intermediate tray of this column is sent to a Hydrolyser. In the Hydrolyser Urea is hydrolyzed to ammonia and carbon dioxide. Hydrolyser vapors are recycled to the stripper for further stripping of ammonia & CO2. The treated condensate is sent to off sites and Utility facility for reuse as Boiler Feed water after polishing.

Block Diagram showing Urea-I Plant manufacturing process is given below in **Figure 14**

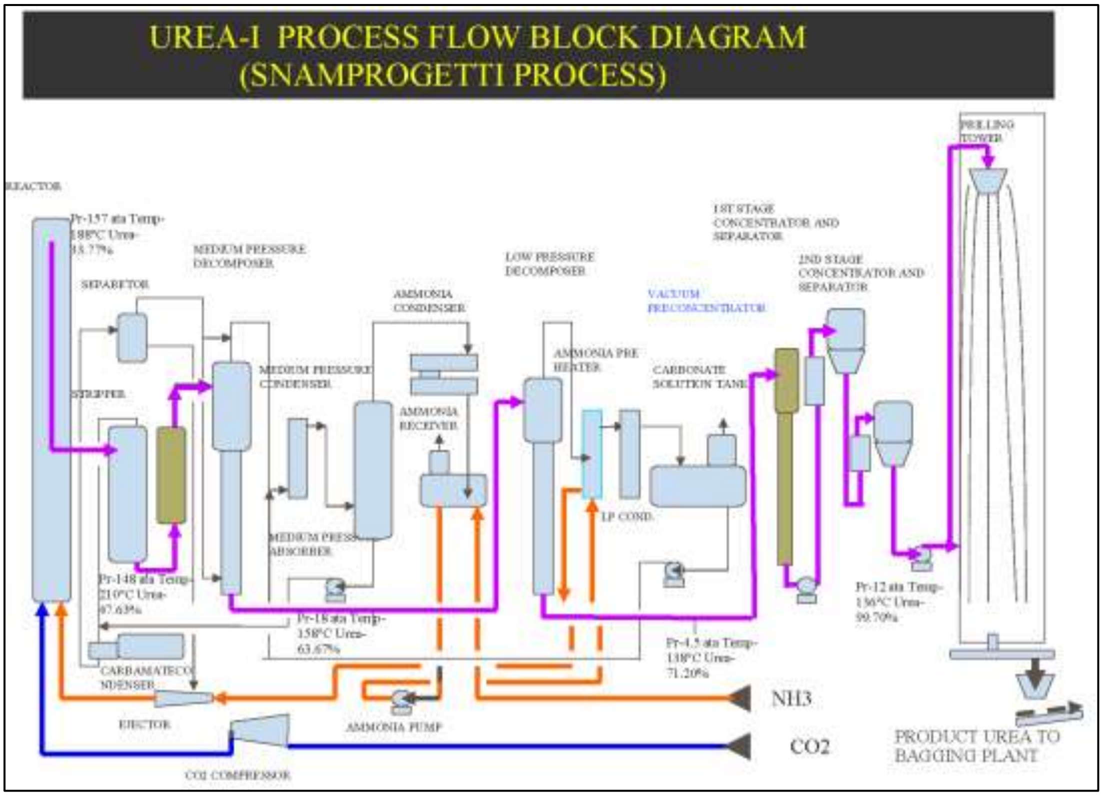


Figure 14: Block Diagram showing Urea-I Plant Manufacturing Process

b) Gadepan Plant- II (G-II)

i. Ammonia-II

Ammonia Plant # 2 is based KBR Ammonia technology and is designed to use Naphtha as well as Natural gas as feed and fuel. After changing the catalyst of Primary reformer only Natural gas can be used as feed & Naphtha can used as fuel i.e. in case of Natural gas shortage. Process features in brief are as below:

1. *Feed Desulphurization*

Sulfur present in Natural gas is treated in Desulphuriser. In Desulphuriser the sulfur compounds in the Natural gas are hydrogenated over cobalt – molybdenum catalyst and sulfur content is reduced to less than 0.2 PPM. Desulphuriser is operated at 350-400°C temperature and 46 Kg/Cm²g pressure. Reaction in Hydrotreater Reactor and Desulphuriser is given as below:

$$RSH + H2 \longrightarrow RH + H_2S$$

$$C_4H_4S + 4\ H_2 \longrightarrow C_4H10 + H_2S$$

$$ZnO + H_2\ S \longrightarrow ZnS + H2O$$

2. *Raw Synthesis Gas Preparation*

Raw Synthesis gas is produced in a series of three major steps.

Primary Reforming of Hydrocarbons in Primary Reformer

NG feed after removal of sulfur is fed into the Primary Reformer along with Process Steam. In Primary Reformer reforming of Hydrocarbons take place in the presence of Nickel catalyst. Reforming reaction, as given below are endothermic in nature and require constant heat input from the Primary Reformer top fired burners to maintain the Primary Reformer outlet temperature.

$$C_2H_{2n+2} + 2H_2O \qquad C_{n-1}H_{2n} + CO_2 + 3H_2 - HEAT$$

$$CH_4 + H_2O \longrightarrow CO + 3H_2 - HEAT$$

$$CO + H_2O \longrightarrow CO_2 + H_2 + HEAT$$

$$CH_4 + 2H_2O \longrightarrow CO_2 + 4H_2 - HEAT$$

Primary Reformer is operated at 39.6 Kg/Cm^2g pressure & inlet/outlet temperature of 475°C/ 810°C. Normal steam to carbon ratio at Primary Reformer inlet remains 3.5:1. The Methane slip from Primary Reformer outlet is 10 %.

3. *Secondary Reforming of Hydrocarbons in Secondary Reformer*

Partly reformed gas from Primary Reformer enters the Secondary Reformer. In Secondary Reformer pre-heated process air from turbine driven Process Air Compressor enters into Secondary Reformer at a pressure of 36.9 Kg/Cm^2g and mixed with process gas from Primary Reformer resulting in rapid combustion and distribution of the heat over the entire surface of the catalyst bed. The combustion zone temperature remains 1252°C. The Methane slip after Secondary Reformer is reduced to 0.3 %.

From the combustion zone of the Secondary Reformer the hot gases passes through the bed of Nickel catalyst to complete the reforming reaction.

Shift Conversion of Carbon monoxide into Carbon dioxide

Shift conversion of CO into CO2 is carried out in two steps:

a) High Temperature Shift Conversion

High temperature shift converter contains a single bed of iron based catalyst. The gas/steam flow from Secondary Reformer enters in High Temperature Shift Converter at about 371°C temperature where a large percentage of CO content is oxidized by the following reaction:

$$CO + H_2O \longrightarrow CO_2 + H_2 + Heat$$

The CO content from HT CO Converter outlet is about 3 %.

b) Low Temperature Shift Conversion

Low temperature shift converter guard and low temperature shift converter contains one bed of copper based catalyst. The process flow from HT CO Converter enters into the low temperature shift converter guard at 217°C and leaves from LT shift converter at 235°C. Shift reaction is given as below:

$$CO + H_2O \longrightarrow CO_2 + H_2 + Heat$$

The CO content from LT CO Converter outlet is about 0.3 %.

4. *Synthesis Gas Purification*

Raw synthesis gas is processed for the removal of carbon dioxide and carbon monoxide to yield a Hydrogen / Nitrogen synthesis gas of high purity. The Benfield process accomplishes removal of the carbon dioxide & yields a synthesis gas about 0.1wt% of Carbon dioxide. The Benfield solution is a 30 % aqueous solution containing potassium carbonate, which absorb the carbon dioxide. The solution also contains additives, which improve the CO_2 absorption rate, inhibit corrosion and helps control foaming of the solution. Flashing, under low pressure into a CO2 Stripping Tower, regenerates the rich solution from bottom of the CO2 Absorber. The Stripper overhead vapors are cooled and the carbon dioxide product is separated from the condensed water and delivered to Urea Plant.

Synthesis Gas from the CO_2 Absorber outlet flow to the Methanator for removal of residual carbon oxides by reacting the carbon oxides with Hydrogen over a catalyst bed producing methane and water as per the following reaction:

$$CO_2 + 4\,H_2 \longrightarrow CH_4 + 2H_2O + \text{Heat}$$

$$CO + 3\,H_2 \longrightarrow CH_4 + H_2O + \text{Heat}$$

5. *Ammonia Synthesis & Refrigeration*

a) Ammonia Synthesis

Methanator outlet synthesis gas is compressed in a turbine driven centrifugal Synthesis Gas Compressor & discharge of the compressor is directed to the Ammonia Converter, which consist of a high-pressure shell containing Iron based catalyst and heat exchanger. After 2nd stage discharge of Synthesis Gas Compressor the synthesis gas passes through the Molecular Sieve Dryers, where any remaining moisture will be absorbed to ensure the dry gas is available for the Ammonia Converter.

The synthesis gas, which has hydrogen & nitrogen in a volumetric ratio of 3:1 and some inerts, is compressed to synthesis loop pressure by Synthesis Gas Compressor and is introduced into the synthesis loop from where it goes to series of Ammonia Converters (containing iron based catalyst) to get maximum ammonia conversion along with re-circulating gas. Ammonia Converter synthesis reaction is given below:

$$N_2 + 3\,H_2 \longrightarrow 2\,NH_3 + \text{Heat}$$

The converter exist gas is cooled in the boiler feed water exchanger, giving up heat to high pressure BFW. Further cooling is accomplished by heat exchange with the converter feed gas and then with cooling water. The synthesis gas then flows through the unitized chiller, a specially designed exchanger consisting of multiple concentric tubes passing through a partitioned four compartment shell. At the outlet of unitized chiller the cold stream enters the Ammonia Separator where liquid Ammonia is removed & letting it down to the Ammonia Let-Down Drum. Vapors from the Ammonia Separator pass to the tube of the utilized chiller and to the recycle stage of the Synthesis Gas Compressor. Liquid Ammonia from the letdown drum is sent to the Urea Plant through warm Ammonia Product Pump.

b) Ammonia Refrigeration System

A four-stage Refrigeration system provides refrigeration for Ammonia condensation in Synthesis loop & synthesis gas compressor make-up chilling. Refrigeration Compressor discharge flows to Ammonia Condenser & after condensation liquid Ammonia is collected into Refrigerant Receiver & from Refrigerant Receiver hot Ammonia is pumped to Urea Plant. Cold Ammonia from the coldest chamber of utilized chiller can be pumped to Ammonia Storage Tank in case of tripping of Urea plant.

6. *Ammonia Absorption and Condensate Recovery*

Purge and letdown gases from the Synthesis loop are fed to an Absorber where ammonia is absorbed in the circulating water. The ammonia free gas is then sent to fuel system. The ammonical water is treated in a Distillation Column to strip out free ammonia, which is condensed and sent to ammonia refrigerant receiver in the refrigeration system.

The process condensate from the separators is treated in a process condensate stripper to remove Ammonia, CO2 and Methanol. The purified condensate is sent to off-sites DM Plant for complete recycle.

Block Diagram showing Ammonia-II Plant manufacturing process is given below in **Figure 15**

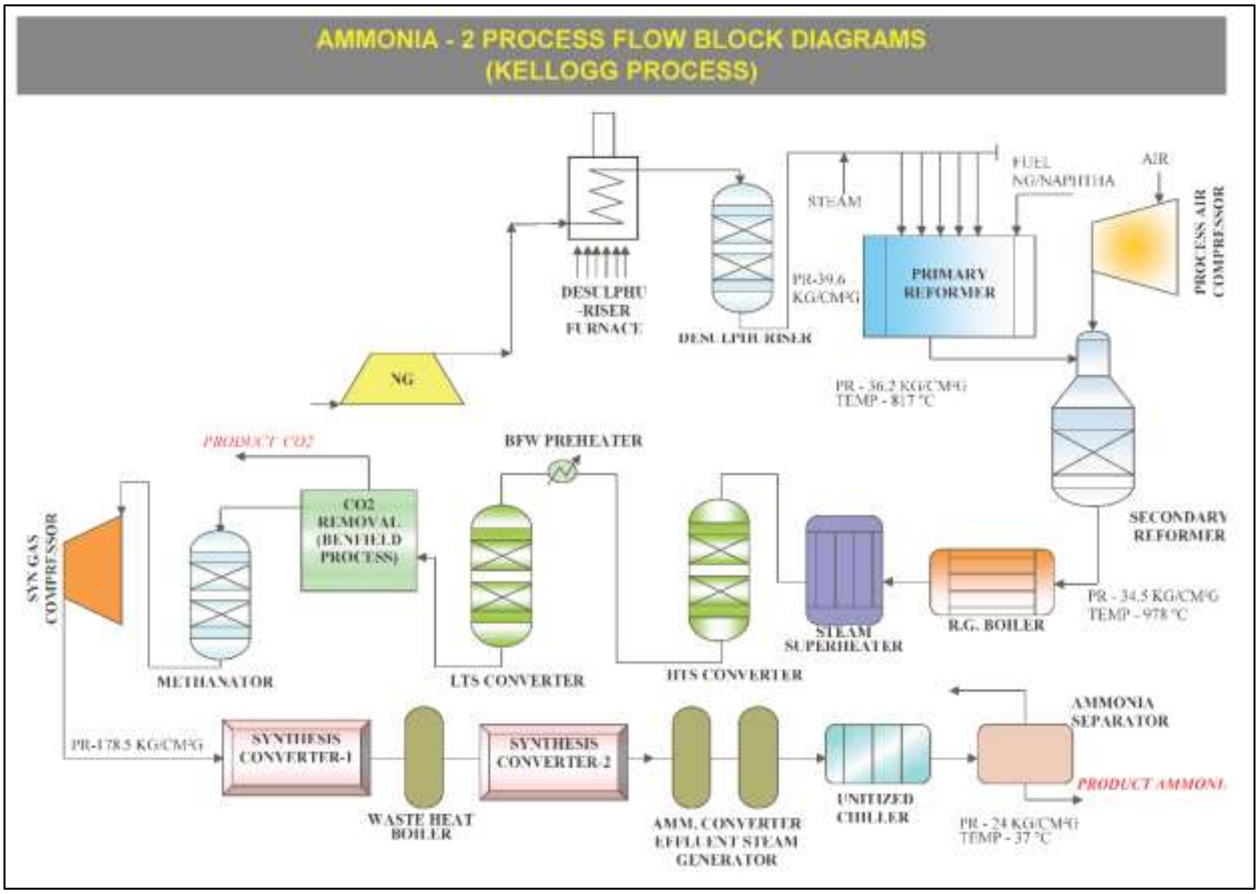


Figure 15: Block Diagram showing Ammonia-II Plant Manufacturing Process

ii. Urea-II

Urea plant is based on TEC's Advance Cost & Energy Saving (ACES) process. This process has the advantage of high Conversion, better heat utilization due to which Low Overall Energy consumptions, High Reliability % lower emission of liquid & gaseous pollutants. Urea Plant consists of two streams each with common Prilling Tower & Process condensate Treatment Section. Major steps/ features of the process are as below:

1. *Synthesis Section*

Liquid Ammonia from Ammonia Plant is collected into Urea Plant Ammonia Receiver and pumped by turbine driven Ammonia Feed Pump to Urea Reactor at 175 Kg/Cm²g pressure. Gaseous Carbon dioxide from Ammonia Plant is compressed by a turbine driven centrifugal CO2 Compressor to 175 Kg/Cm²g pressure and fed to Stripper for CO2 Stripping & partly to LP Decomposer for low pressure CO2 Stripping.

Anti-Corrosion air for the synthesis loop in also added at 2nd Stage suction of CO2 Compressor. Recovered recycle carbamate solution from purification section is pumped by a turbine driven centrifugal Carbamate Feed Pump and fed to the Urea Reactor through Carbamate Condensers. Exothermic reaction between Liquid ammonia & gaseous carbon dioxide in Urea Reactor is given below:

a) Carbamate Formation

$$2\,NH_3 + CO_2 \longrightarrow NH_2\,COO\,NH_4 \quad + \text{Heat}$$

Ammonium Carbamate

b) Dehydration

$$NH_2\,COO\,NH_4 \longrightarrow NH_2\,CO\,NH_2 + H_2O \quad - \text{Heat}$$

Urea

Urea Reactor is operated at 175 Kg/Cm²g pressure and 190°C temperature and at NH3/CO2 & H2O/CO2 molar ratio of 4 & 0.65 respectively. Synthesis Urea solution passes from Reactor enters into Stripper by gravity. In Stripper upper trays the composition of solution is adjusted adiabatically for effective CO2 stripping. In the lower part of stripper Ammonium Carbamate and excess ammonia are decomposed and separated by CO2 Stripping and steam heating in the falling film type heater. Stripper is operated at 175 Kg/Cm²g pressure and 178°C outlet temperature. Stripper overhead vapors are condensed and absorbed in Carbamate Condensers. Urea Reactor top vapors, containing small quantities of Ammonia and CO2 is fed to Scrubber for recovery of Ammonia & CO2, Scrubber top vapors is fed to HP Absorber for further recovery of Ammonia & CO2.

2. *Purification Section*

Synthesis Urea Solution Produced in the Synthesis section is fed to the purification section where Ammonium Carbamate and excess ammonia decomposed and separated by pressure reduction & heating. Purification section is further divided into two parts.

a) HP Decomposition

Pressure of Synthesis Urea solution is reduced from 172 to 17.5 Kg/Cm²g and is heated to 158°C in No.2 Carbamate Condenser & fed to HP Decomposer. In HP Decomposer the Ammonia & CO2 vapors in the synthesis Urea solution are separated and are then fed to Absorbers for further recovery and finally recycled to the Synthesis Section.

HP Decomposer is operated at 17.5 Kg/Cm²g pressure and 158°C temperature.

b) *LP Decomposition*

Urea solution from HP Decomposer is heated in LPD pre-heater by means of low pressure steam after further pressure reduction to 2.5 kg/cm2g. The solution is then further fed to the LP Decomposer.

LP Pre-heater & LP Decomposer is operated at 2.5 Kg/Cm²g pressure with LPD outlet (bottom) temperature of 129°C. CO2 stripping in LP Decomposer at the lower packed bed accelerates separation of Ammonia. The Ammonia and CO2 vapors from Urea solution are separated and are fed to LP absorber for recovery and finally recycled to Absorbers. LP Decomposer outlet solution is fed to flash separator, in which flashing under vacuum separates residual Ammonia & CO2. The urea solution at LP Decomposer outlet contains about 66.3 Wt. % of Urea.

3. *Concentration section*

Urea solution from the purification section is first fed to Lower Vacuum Concentrator, which is operated at the pressure of 150 MMHGA vacuum and a temperature of 77°C for concentration to about 84 Wt.% Urea. Further urea solution is heated to 132°C under 150 MMHGA vacuum by low-pressure steam to attain Urea concentration of 97.5 Wt.% at the outlet of Upper Vacuum Concentrator.

In the last stage of this section, concentrated urea solution is fed to Final Concentrator and is heated to 138°C temperature by low-pressure steam. Final concentrator is operated under 25 MMHGA vacuum. After Final Concentrator, Molten Urea Pump, pumps urea (99.8 Wt.%) to Prilling Tower top.

Water vapors from the concentration section are condensed in cooling water Surface Condensers and recovered condensate, which contains urea mist, CO2 and Ammonia is sent to Process Condensate treatment section.

4. *Prilling Section*

99.8 Wt.% concentrated molten urea solution is sprayed, cooled and solidified to produce prilled Urea in Prilling Tower. Cooling air is sucked through the intake at the Prilling Tower bottom and rises inside the tower. This air is blown out of the Tower by natural draft. Droplets of 99.8 Wt.% molten urea are formed by Prilling Bucket which uses centrifugal force. Urea Prills thus produced are collected through Scrapper & are sent to Bagging Plant.

5. *Process Condensate Treatment Section*

The condensate from concentration section is collected in the Process Condensate Tank and then sent to Process Condensate Stripper and Urea Hydrolyzer for treatment.

Process Condensate Stripper and Urea Hydrolyzer is operated at the pressure of 3 Kg/Cm²g & 23 Kg/Cm²g respectively. Recovered Ammonia & CO_2 vapors from Process Condensate treatment section are recycled to LP Decomposer of the purification section for recovery.

The treated condensate is discharged to off sites and Utility facility.

Block Diagram showing Urea-II Plant manufacturing process is given below in **Figure 16**

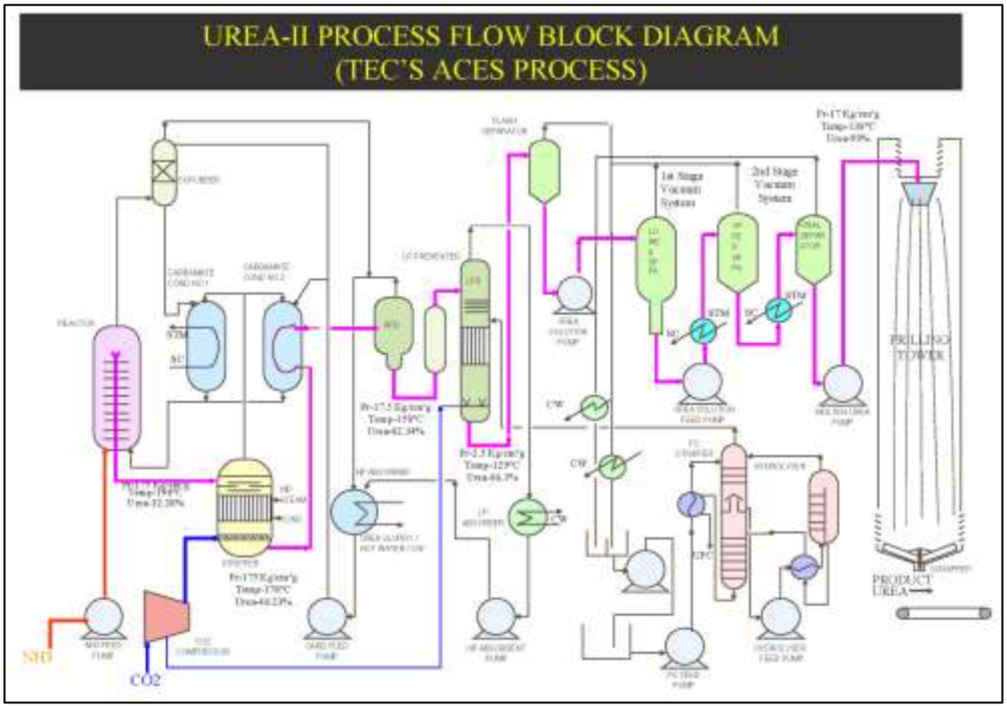


Figure 16: Block Diagram showing Urea-II Plant Manufacturing Process

c) Gadepan Plant- III (G-III)

i. Ammonia-III

Ammonia-3 plant is based on M.W. KBR Purifier Process, low energy natural gas reforming process offered and licensed by KBR. Natural Gas is used as a feedstock. Flow Diagram of Ammonia-3 Plant is given in Figure and process features in brief are as below:

- Feed gas compression & desulfurization
- Primary Reforming

- Process air compression & gas turbine drive
- Secondary Reforming
- Carbon monoxide shift conversion
- Carbon dioxide removal
- Methanation
- Drying
- Cryogenic purification
- Compression
- Ammonia synthesis
- Loop purge ammonia recovery
- Ammonia refrigeration
- Process condensate stripper

Feed Gas Compression and Desulphurization

Natural gas for feed and fuel is supplied to Ammonia battery limit at specified conditions. Part of the natural gas is sent to the Gas Turbine and Reformer as fuel after preheating. The natural gas for feed is compressed in a single stage centrifugal motor driven compressor to about 51 kg/cm2a.

The natural gas contains total sulfur of max 10 ppmv as H2S. Organic sulphur can be upto 10 ppmv max. Sulphur is a poison to most catalysts used in the downstream process and must be removed.

The desulfurization of the feed gas is accomplished in two separate steps. In the first step, the heated gas passes through a single Hydrotreater vessel which contains hydrogenation catalyst, Cobalt/Molybdenum oxide (CoMox). The organic sulphur compounds like mercaptans and carbonyl sulphide present in the feed gas is converted into hydrogen sulphide over the CoMox catalyst in the presence of the hydrogen following the typical reactions

$$RSH + H_2 \longrightarrow RH + H_2S$$

$$C_4H_4S + 4\,H_2 \longrightarrow C_4H_{10} + H_2S$$

In the second step the process gas passes through the two Desulfurizer vessels, each containing a bed of Zinc Oxide catalyst. The hydrogen sulphide in the gas reacts with and is retained by the ZnO catalyst according to the reaction below and producing an effluent stream containing less than 0.1 ppmv sulfur

$$\underset{\text{(Zinc Oxide)}}{ZnO} + \underset{\text{(Hydrogen Sulfide)}}{H_2S} \longrightarrow \underset{\text{(Zinc sulphide)}}{ZnS} + \underset{\text{(Water)}}{H_2O}$$

Primary Reforming

The desulfurized feed is mixed with medium pressure steam prior to reforming. The process steam is added to achieve a 2.7 steam to carbon molar ratio in the mixed feed gas. The mixture is preheated to about 542°C in the convection section of the primary reformer. The feed gas passes down through the reforming catalyst tubes and is reacted to form hydrogen, carbon monoxide and carbon dioxide. The primary reforming reactions as well as water gas shift reaction will occur on the catalyst and are as follows:

$$C_nH_{2n+2} + 2H_2O \longrightarrow C_{n-1}H_{2n} + CO_2 + 3H_2 - \text{HEAT}$$

$$\underset{\text{(Methane)}}{CH_4} + \underset{\text{(Water)}}{H_2O} \longrightarrow \underset{\text{(Carbon Mono-oxide)}}{CO} + \underset{\text{(Hydrogen)}}{3H_2} - \text{HEAT}$$

$$\underset{\text{(Carbon Mono-oxide)}}{CO} + \underset{\text{(Water)}}{H_2O} \longrightarrow \underset{\text{(Carbon Di-oxide)}}{CO_2} + \underset{\text{(Hydrogen)}}{H_2} - \text{HEAT}$$

$$CH_4 + 2H_2O \longrightarrow CO_2 + 4H_2 - \text{HEAT}$$

Overall the combination of reactions is endothermic, with the duty supplied by fuel gas burners located between the rows of tubes.The methane slip at the outlet of Primary Reformer is around 28%.

<u>Process Air Compression and Gas Turbine Drive</u>

The process air compressor is gas turbine driven. The process air compressor provides process air for the secondary reformer plus for instrument and plant air.

<u>Secondary Reforming</u>

The process gas from Primary Reformer exit contains about 55.7% hydrogen and 28.6% methane (dry volume basis) as it leaves the Primary Reformer furnace and enters the Secondary Reformer. In the Purifier process, about 50 percent extra process air is normally used. This results in a hydrogen/nitrogen molar ratio of 2.0 at the inlet of the Purifier cold box. The extra air provides additional reaction heat in the secondary reformer and helps to keep the temperature of the gas lower at exit the primary reformer.

In Secondary Reformer the oxygen in the air combusts part of the process gas from the primary reformer leading to a high temperature (approx. 1358°C) in a special combustion chamber above the catalyst bed. The hot gas from this combustion passes down through a bed of nickel reforming catalyst where it reacts to produce more hydrogen in a similar manner to the primary reformer, but without outside heat transfer. Due to the overall endothermic nature of the reforming reaction, the gas temperature leaving the secondary reformer is reduced to approximately 904°C.

The Secondary Reformer effluent passes directly to the Secondary Reformer Waste Heat Boiler, where high-pressure steam is generated in a vertical, natural circulation boiler. The partially cooled gas then passes through the H.P. Steam Superheater, cooling it to the high temperature shift inlet temperature of 371°C.

<u>Carbon Monoxide shift conversion</u>:

The CO shift reaction rate is favoured by high temperature, but the equilibrium conversion of CO to CO2 is favoured by low temperature. There are two shift reaction stages in this unit, the High Temperature Shift Converter and the Low Temperature Shift Converter. In the two stages of shift conversion provided, the HTS operates with a 371°C inlet and the LTS with a 205°C inlet. Shift conversion of CO to CO2 is carried out in two steps:

a. High Temperature Shift Conversion

   In the high temperature shift, a relatively low cost and more durable iron oxide catalyst produces the bulk of the shift conversion, to 3.15 mole % CO (dry basis). For the relatively low steam to gas ratio used for this plant, the HTS also contains a copper promoter to prevent unwanted side reactions that could harm the catalyst. Shift conversion reaction is stated as follows:

$$\underset{\text{(Carbon Mono-oxide)}}{CO} + \underset{\text{(Water)}}{H_2O} \longrightarrow \underset{\text{(Carbon Di-oxide)}}{CO_2} + \underset{\text{(Hydrogen)}}{H_2} + \text{Heat}$$

b. Low Temperature Shift Conversion

   A more favourable equilibrium concentration (lower CO) is attained with the low temperature shift copper based catalyst. The CO leakage obtained from this combination is 0.27 mole % (dry basis).

LTS catalyst permits a considerable reduction in the quantity of steam required for the overall shift conversion, but it is more expensive and susceptible to poisoning from process impurities, especially sulfur and chlorides. Shift conversion reaction is stated as follows:

$$\underset{\text{(Carbon Mono-oxide)}}{CO} \quad + \quad \underset{\text{(Water)}}{H_2O} \longrightarrow \underset{\text{(Carbon Di-oxide)}}{CO_2} \quad + \quad \underset{\text{(Hydrogen)}}{H_2} \quad + \text{Heat}$$

Heat is recovered from the LTS effluent gas in three exchangers. It is first used to preheat high pressure BFW in the LTS Effluent/BFW Exchanger, then to provide reboiler heat for the OASE CO2 removal section in the CO2 Stripper Reboiler, and finally to preheat deaerator feed water in the LTS Effluent/DM Water Exchanger. The LTS effluent gas then enters the CO2 Absorber at 70^{o}C.

<u>CO2 Removal Section (OASE Process)</u>

The CO2 contained in the shifted process gas is next reduced to 500 ppmv by washing in a two–stage activated amine based system that utilizes the OASE process licensed by BASF.

The process gas first enters the bottom section of the CO2 Absorber where the bulk of its CO2 content is removed by absorption into semi-lean OASE solution. The gas then passes to the top section of the Absorber where most of the remaining CO2 is removed by absorption into lean solution. The purified synthesis gas passes through a demister at the top of the Absorber, and to the CO2 Absorber Overhead Knockout Drum to remove any traces of entrained OASE solution and leaves the CO2 Absorber at 50 °C.

The rich OASE solution from the bottom of the Absorber is first passed through the Hydraulic Turbine, where power is recovered by letting down the high pressure solution. This power is used to drive one of the semi-lean solution pumps. The solution pressure at the exit of the hydraulic turbine is set to allow the major portion of the hydrogen dissolved in the solution to be flashed off. The bottom section of the HP Flash Column allows full disengagement of the gas from the solution. The flashed gas contains a substantial amount of CO2. The HP flash gases are washed in with lean solution to maximize CO2 recovery before sending the flash gases to fuel system.

The solution from the bottom of HP Flash Column is then flashed to about 2 kg/cm2(a) in the LP Flash Column. Most of the semi-lean solution from LP Flash Column is pumped back to the middle of the Absorber by the Semi-lean Solution Pumps. The rest of the semi-lean solution is pumped by the Semi-Lean Solution Circulating Pumps, through the Lean/Semi-Lean Exchanger, where it is heated to about 115oC, before it goes to the top of the CO2 Stripper. A slip stream of the semilean solution is routed back to LP Flash Column through a mechanical filter (OASE Solution Filters). Heat for the stripping action is provided by the CO2 Stripper Reboiler. The stripped lean OASE solution is cooled first by heat exchange with the semi-lean solution in Lean/Semi-Lean Exchanger. It is further cooled by heat exchange with DM water in the Lean Solution/DM Water Exchanger and then cooled in the Lean Solution Cooler by cooling water. The lean solution is then pumped back to CO2 Absorber by the Lean Solution Pumps. The CO2 stream from the top of the LP flash Column is cooled to 40°C and product CO2 is sent to Urea plant.

<u>Methanation</u>

The overhead gas from the carbon dioxide absorber is preheated from 50°C to 316°C in the Methanator Feed/Effluent Exchanger and Methanator Heater. The gas then flows through the methanator where the remaining carbon oxides combine with hydrogen over a nickel catalyst to form methane and water.

The Methanator contains a bed of nickel catalyst that promotes the reaction of carbon dioxide and carbon monoxide with hydrogen to form methane and water.

$$\underset{\text{(Carbon Di-oxide)}}{CO_2} + \underset{\text{(Hydrogen)}}{4\,H_2} \longrightarrow \underset{\text{(Methane)}}{CH_4} + \underset{\text{(Water)}}{2H2O} + \text{Heat}$$

$$\underset{\text{(Carbon Mono-oxide)}}{CO} + \underset{\text{(Hydrogen)}}{3\,H_2} \longrightarrow \underset{\text{(Methane)}}{CH_4} + \underset{\text{(Water)}}{H2O} + \text{Heat}$$

Drying

In preparation for drying, the methanator effluent is cooled by heat exchange with methanator feed and cooling water and then further cooled with ammonia refrigerant in another exchanger to about 4°C.

The chilled gas from the knockout drum goes to the syngas driers, containing solid desiccants. Exiting these driers the total of water, CO2 and NH3 content is reduced to less than 1.0 ppmv on a type 13X Zeolite (alumino silicate) bead. Filters are provided at the drier outlet.

The regeneration facilities are designed for about 20-hour cycle to provide a comfortable safety margin as the drying cycle works on 24 hour cycle basis.

Cryogenic Purification

Dried raw synthesis gas is cooled to about minus 129°C in the cryogenic purifier by heat exchange with make-up syngas and with purifier vent gas in the upper plate fin exchanger. The gas then flows through a turbo expander, where energy is removed to develop the net refrigeration required for the purifier.

The expander effluent is further cooled to about minus 173°C and partially condensed in the lower section of upper plate fin exchanger and then enters the purifier rectifier column. Liquid from the bottom of the rectifier is partially evaporated at reduced pressure in the shell side of the rectifier overhead condenser. This cools the rectifier overhead and generates reflux for the rectifier.

The rectifier bottoms contain the excess nitrogen, all of the methane and about 60 percent of the argon. The partially evaporated liquid leaving the shell side of the rectifier overhead condenser is reheated and vaporized by exchange with the purifier feed and then leaves the purifier as waste gas. The waste gas is used to regenerate the syngas drier and then burned as fuel in the primary reformer.

The make-up syngas from the top of the rectifier overhead condenser is reheated by exchange with purifier feed to about 1.8°C and sent to the syngas compressor. The operation of the purifier is controlled by a hydrogen analyzer on the syngas, to maintain the exact ratio of 2.998 to 1 (hydrogen to nitrogen). The only remaining contaminant in the make-up syngas is about 0.2 percent argon.

Compression

The purified syngas is compressed in two stages in the Syngas Compressor, to about 150.3 kg/cm2(a). Recycle gas is added to the syngas before the last wheel of the second stage, and the combined flow leaves the compressor at about 157.9 kg/cm2(a). This combined gas is preheated and then fed directly to the synthesis converter. The compressor is driven a HP-extraction and condensing steam turbine. The syngas compressor speed is controlled to maintain the suction pressure.

Ammonia Synthesis

Ammonia is produced in a fixed-bed, horizontal converter. The converter is a three thermodynamic stage, intercooled design. The third stage is divided into two beds in series, so the converter contains a total of four beds. Each bed is filled with 1.5-3mm iron promoted conventional catalyst. The first bed is filled with pre-reduced catalyst. Make-up and recycle gases from the syngas compressor are preheated by exchange with the converter effluent in the feed/effluent exchanger. It then flows to the converter. Ammonia concentration in the feed to the converter is about 1.8 mole percent.

The effluent from the first bed containing about 10.8 percent ammonia is cooled by heat exchange with the feed to the converter. Heat is recovered from the second bed effluent by preheating the feed to the first bed. Ammonia concentration in the effluent from the second bed is about 16.1 mole percent. Final ammonia concentration leaving the converter is 19.9 percent.

The ammonia synthesis reaction is equilibrium governed, and proceeds with a significant exothermic temperature rise across the catalyst. The reaction step is as follows:

$$N_2 + 3\,H_2 \longrightarrow 2\,NH_3 + \text{Heat}$$

The heat of reaction from the ammonia synthesis is recovered by the steam system in the Ammonia Converter Effluent/Steam Generator and Ammonia Converter Effluent/BFW Preheater.

After heat recovery in above stated exchangers, the converter effluent is cooled by exchange with fresh make up syngas from the syngas compressor discharge in the Ammonia Converter Feed/Effluent Exchanger, and by cooling water in the Ammonia Converter Effluent Cooler.

The converter effluent gas is further cooled and condensed in the Ammonia Unitized Chiller. This specially designed exchanger provides cooling of the converter effluent through interchange of heat with synthesis gas returning from the Ammonia Separator, and boiling ammonia liquid at four different temperature levels (16.6ºC, -2.2ºC, -17.8ºC and – 33.6ºC). By its unitized design, it replaces four separate exchangers, four refrigerant drums, feed/effluent exchangers and the interconnecting piping.

Approximately 1.7 percent of the vapor from Ammonia Separator is removed from the synthesis loop to purge it of argon, which is contained in the makeup gas. This high pressure purge gas flow is adjusted to maintain the inert gas level in the ammonia converter feed gas to approximately 3.5 mole percent and is directed to the purge gas recovery section.

Recycle vapor from the ammonia separator, containing nearly 2.63 mole percent ammonia is reheated in the Unitized Chiller. The reheated recycle vapor is directed to the synthesis gas compressor and recirculated for reuse as feed to the converter.

Loop Purge Ammonia Recovery

The purge gas stream from Ammonia Separator flows to the HP Ammonia Scrubber, for recovery and removal of the ammonia it contains down to a level about 20 ppmv (50 ppmv max). The essentially ammonia free gas is divided into two parts. One part is normally sent to the fuel system. The other part is mixed with the feed natural gas upstream of Desulphurizer and ZnO Absorber vessels as recycle Hydrogen.

Liquid ammonia from Ammonia Separator is depressurized and flashed to a pressure of 19.0 kg/cm2(a) in the Ammonia Letdown Drum. The flashed vapor, primarily dissolved synthesis gas, is mixed with the refrigeration system purge gas and sent to the LP Ammonia Scrubber. The remaining liquid ammonia product is then split into streams leading to the ammonia refrigeration system in Unitized Chiller and the ammonia Refrigerant Receiver. The washed gas stream exit LP Ammonia Scrubber is sent to the fuel system.

The HP purge gas stream (from loop) is fed to the HP Ammonia Scrubber, and LP flash gas stream is fed to the separate LP Ammonia Scrubber. In both HP and LP Scrubbers, ammonia in the gas stream is recovered as an aqueous ammonia solution. The combined aqua solution from both columns is fed to Ammonia Distillation Column, which is reboiled by MP steam. The recovered overhead ammonia vapor is combined with the main ammonia stream going to the Ammonia Condenser.

Ammonia Refrigeration

Ammonia is condensed from the converter effluent stream by chilling with ammonia refrigerant at four levels in the previously described unitized chiller. The ammonia vapors from the four refrigeration levels are routed to Ammonia Refrigeration Compressor. The refrigeration compressor also processes the ammonia vapor from the methanator effluent chiller. There is a provision to add ammonia vapor from existing ammonia storage tank to Ammonia Refrigeration Compressor suction. The ammonia vapor is ultimately compressed and condensed in a CW cooled Ammonia Condenser, and goes to the warm section of the ammonia accumulator.

The small amount of non-condensable gas in the ammonia accumulator goes to the ammonia recovery system as mentioned before where ammonia is washed out with water.

The liquid ammonia from the cold section of the ammonia accumulator is used as refrigerant. The cold ammonia product is drawn from the cold section of the unitized exchanger and is sent to the ammonia storage via the Ammonia Product Pump. The warm ammonia product is drawn from the warm section of the Ammonia accumulator and pumped to the Battery Limit for urea plant.

Process Condensate Stripper

The process condensate from the separators is treated in a process condensate stripper to remove in a high pressure process condensate stripper to remove Ammonia, CO2 and Methanol. The purified condensate is sent to Offsites & Utilities facilities for reuse as Boiler feed water, after treatment in the polisher unit.

Block Diagram showing Ammonia-III Plant manufacturing process is given below in **Figure 17**

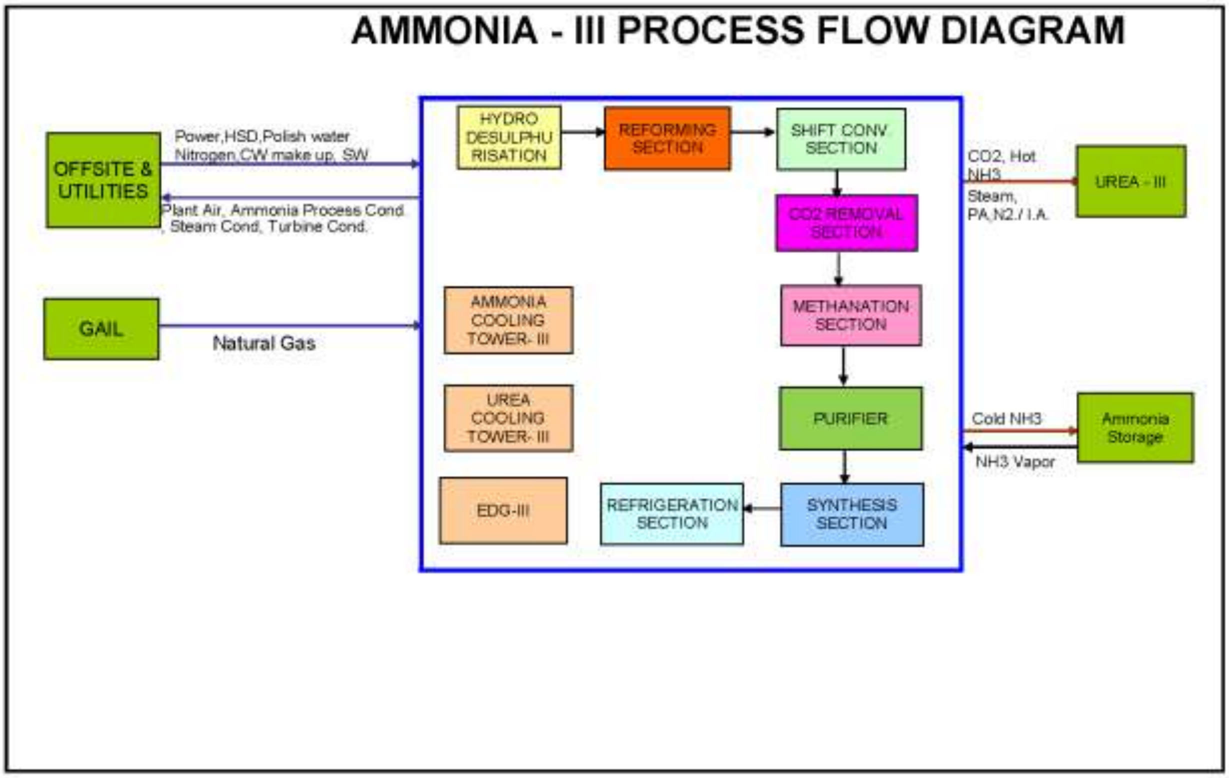


Figure 17: Block Diagram showing Ammonia-III Plant Manufacturing Process

ii. Urea-III

Urea plant is based on TEC's Advance Cost & Energy Saving (ACES) process. This process has the advantage of high Conversion, better heat utilization due to which Low Overall Energy consumptions, High Reliability % lower emission of liquid & gaseous pollutants. Urea Plant consists of two streams each with common Prilling Tower & Process condensate Treatment Section. Major steps/ features of the process are as below:

The urea process consists of following 5 sections, and the process is described in detail in subsequent paragraphs.

(a) Synthesis Section
(b) Purification Section
(c) Concentration Section
(d) Prilling Section
(e) Process Condensate Treatment Section

Synthesis Section

Liquid Ammonia from Ammonia Plant is collected into Urea Plant Ammonia Receiver and pumped by motor driven Ammonia Feed Pump to Urea Reactor through No.1 and No.2 Ammonia Preheater and HP Carbamate Ejector at 200 Kg/Cm²g pressure. Gaseous Carbon dioxide from Ammonia Plant is compressed by a turbine driven centrifugal CO2 Compressor to 160 Kg/Cm²g pressure and fed to Stripper for CO2 Stripping, Reactor & partly to LP Decomposer for low pressure CO2 Stripping.

CO2 Compressor also feeds anti-corrosion air for the synthesis loop. The passivation air is injected to the intermediate stage of CO2 Compressor.

Recovered recycle carbamate solution from purification section is pumped by a motor driven centrifugal Carbamate Feed Pump and fed to the Urea Reactor through Carbamate Condensers. Exothermic reaction between Liquid ammonia & gaseous carbon dioxide in Urea Reactor is given below:

a) Carbamate Formation

$$2\,NH_3 + CO_2 \longrightarrow \underset{\text{Ammonium Carbamate}}{NH_2\,COO\,NH_4} \quad + \text{Heat}$$

b) Dehydration

$$NH_2\,COO\,NH_4 \longrightarrow \underset{\text{Urea}}{NH_2\,CO\,NH_2} + H_2O \quad - \text{Heat}$$

Reactor is operated at 155 kg/cm^{2}G pressure and 182˚C temperature, and at NH_3/ CO_2 molar ratio of 3.7. Reactor is a vertical tower with five internal baffle plates. The operating pressure of Stripper and Carbamate Condenser are substantially same as that of Reactor.

The synthesis urea solution, after attaining high once-through CO_2 conversion of 64wt% in Reactor, is led to Stripper. The synthesis urea solution from Reactor is stripped by CO_2 gas and heated in the falling film type heater. Major volume of ammonium carbamate and excess ammonia contained in the synthesis urea solution is decomposed and separated in Stripper. The operating conditions of Stripper are 155kg/cm^{2}G pressure and 171˚C temperature. The stripped off gas is sent to Carbamate Condenser. After the CO_2 Stripping in Stripper, the solution containing about 13 -14wt% of $NH_{3,}$ and CO_2 is sent to Purification Section.

In Carbamate Condenser, $NH_{3,}$ and CO_2 gas condense to form ammonium carbamate and urea in the shell side. The condensation heat is utilized to generate 5 kg/cm^{2}G steam in the tube side. A packed bed is provided at the top of Carbamate Condenser to absorb uncondensed NH_3 and CO_2 gas in the recycle carbamate solution from the Recovery Section. The gas from top of the Carbamate Condenser is fed to HP absorber for further recovery of NH_3 and CO_2 gas and the solution from the bottom is fed to Reactor through HP Carbamate Ejector

Purification Section

The synthesis urea solution produced in the Synthesis Section is fed to the Purification Section, where ammonium carbamate and excess ammonia contained in the synthesis urea solution are decomposed and separated by pressure reduction and heating. The urea solution is purified to about 70wt% concentration, with residual ammonia of about 0.5wt%, and it is sent to the Concentration Section.

HP Decomposition

HP Decomposer is operated at the pressure of 16.5 kg/cm^{2}G and at the temperature of 152˚C

The synthesis urea solution fed into HP Decomposer (U-DA3201/4201) is heated by the LP steam and MP steam condensate in the falling film type internal heat exchanger of HP Decomposer, for decomposition of ammonium carbamate into gaseous ammonia and CO_2, which are then sent to HP Absorber (U-EA3401/4401) of the Recovery Section.

The urea solution, after most of the ammonium carbamate is separated in HP Decomposer, is then fed at the reduced pressure of 2.6 kg/cm^{2}G to LP Decomposer,.

LP Decomposition

LP Decomposer is operated at the pressure of 2.6 kg/cm^{2}G and at the temperature of 129˚C. The heat required for gaseous ammonia and CO_2 separation in LP Decomposer is supplied by the condensation heat of the gas recovered from Process Condensate Stripper (U-DA5501) of the Process Condensate Treatment Section and by steam heating in the internal falling film type heater of LP Decomposer. CO_2 stripping at the lower packed bed accelerates separation of NH_3.

The gas separated in LP Decomposer is sent to LP Absorber (U-EA3402/4402) of the Recovery Section. The urea solution, after separation of gas in LP Decomposer, is fed for the final stage purification to Flash Separator (U-FA3205/4205), and residual ammonia and CO_2 are separated further by flashing under vacuum pressure.

The urea solution at the Urea Solution Tank outlet contains about 70wt% of urea and about 0.5wt% of ammonia, and is sent to the subsequent Concentration Section.

Concentration Section

The urea solution from the Purification Section is fed to Vacuum Concentrator (U-FA3202/4202), which is operated at the pressure of 250mmHgA vacuum and at the temperature of 132˚C, for concentration to about 96 wt% of urea. A part of heat required for H_2O evaporation is supplied from the recovery of adsorption and condensation heat of gaseous ammonia and CO_2 from HP Decomposer in heater of Vacuum Concentrator (U-EA3201/4201) and the rest of the heat is supplied by low pressure steam.

In the last stage of this Section, the concentrated urea solution is fed to Final Concentrator (U-EA3202/4202) and is heated to 138°C by low pressure steam. After the solution is concentrated to 99.7 wt% of urea under 25mmHgA vacuum in Final Separator (U-FA3203/4203), it is pumped up to Prilling Tower top by Molten Urea Pump. The water vapor is treated at the Process Condensate Treatment Section.

Prilling Section

The molten urea concentrated to 99.7 wt% of urea in the Concentration Section is sprayed, cooled and solidified to produce product prilled urea in the Prilling Tower.

Cooling air is sucked through the intake at the Tower bottom and rises inside the Tower by natural draft. Droplets of molten urea of 99.7 wt% concentration are formed by Prilling Device / Prilling Basket which uses centrifugal force. While descending in the Tower, the urea droplets come into contact with the rising air, get cooled and solidified before reaching the Tower bottom.

The urea prills thus produced are collected by Scraper (U-JJ5301). When the product prill temperature is less than 55˚C, it is sent to the Urea Storage as product after being weighed by Belt Scale (U-JW5301). Product Cooler (U-EA5301) is provided so that the product prill of 65 ˚C can be cooled to 55˚C before being sent to the Urea Storage as product via belt scale

Process Condensate Treatment Section

The condensate from concentration section is collected in the Process Condensate Tank and then sent to Process Condensate Stripper and Urea Hydrolyzer for treatment.

Process Condensate Stripper and Urea Hydrolyzer are operated at the pressure of 3 Kg/Cm^{2}g & 24 Kg/Cm^{2}g respectively.

Recovered Ammonia & CO2 vapors from Process Condensate treatment section are recycled to LP Decomposer of the purification section for recovery. The treated condensate is discharged to off sites and Utility facility.

Block Diagram showing Urea-III Plant manufacturing process is given below in **Figure 18**

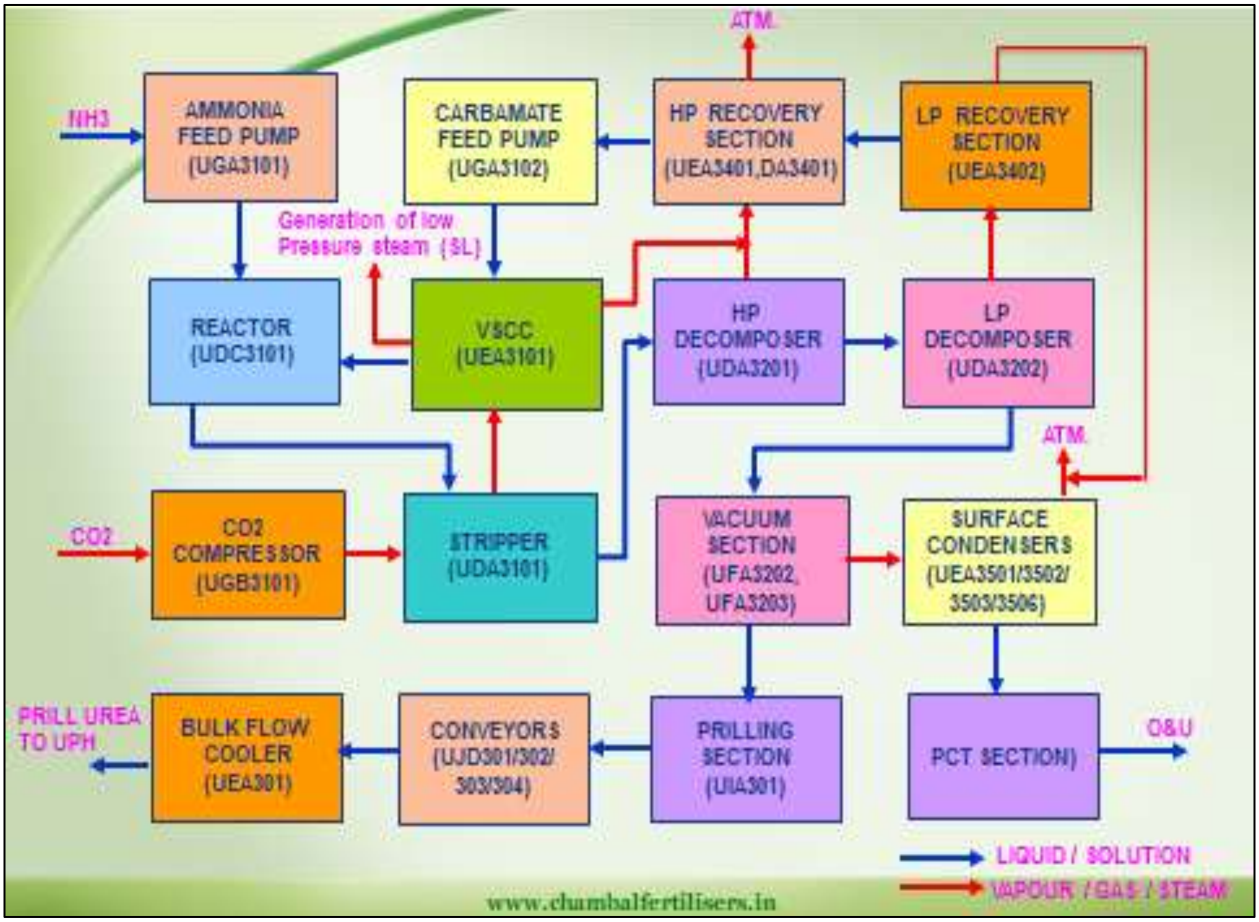


Figure 18: Block Diagram showing Urea-III Plant Manufacturing Process

3.4 Raw material required along with estimated quantity, likely source, marketing area of final products, mode of transport of raw material and finished product.

1. <u>Proposed</u>

Anhydrous ammonia and air are the major raw materials for Weak Nitric Acid and Ammonium Nitrate plants. Ambient air will be compressed by air compressor for process requirements. Anhydrous ammonia will be supplied in liquid form from existing atmospheric ammonia storage tanks available in CFCL premises. It will be purchased from existing CFCL Gadepan Plant. Further details are tabulated below in **Table 8.**

Table 8: Raw Material Required for Proposed TAN Plant

S No.	Raw material	Unit	Daily requirement	Mode of transport	Likely source
Weak Nitric Acid (WNA) Plant					
1.	Anhydrous Ammonia (Liquid)	MT	170 @ 0.284 MT/MT	Pipeline	CFCL ammonia plants / outside suppliers
Technical Ammonium Nitrate (TAN) Plant – AN Melt / Prilled HDAN/LDAN					
1.	Weak Nitric Acid (WNA)	MT	553 @ 0.789 MT/MT	Pipeline	Captive production in WNA plant
2.	Anhydrous Ammonia (Liquid)	MT	150 @0.214 MT/MT	Pipeline	CFCL ammonia plants / outside suppliers
Concentrated Nitric Acid (CNA)					
1.	Weak Nitric Acid (WNA)	MT	250 @ 1.67 MT/MT	Pipeline	Captive production in WNA plant
2.	Magnesium Nitrate	MT	0.24 @ 1.6 kg/MT	Road	To be procured from market

Catalyst

For ammonia Oxidation - Precious metal (Pt /Rh) gauze. The net catalyst consumption per ton of nitric acid is, including the credit of Pt /Rh recovery from the recovery gauzes, is 40 mg/MT of Weak Nitric acid. However, this consumption will be reviewed at engineering stages of the project.

De-NOx Abator - Before venting the tail gas into atmosphere, NOx level in the tail gas shall be reduced to the acceptable limit by selective catalytic reduction with ammonia in presence of Vanadium Pentoxide or Platinum or Iron/Chromium oxides catalysts. However, this process will be firmed up at engineering stages of the project.

Ammonium Nitrate manufacturing process does not require any Catalyst. Similarly, CNA manufacturing does not require any catalyst.

Catalysts and chemicals will be delivered to the plant by road transportation.

Finished Product

Prilled Ammonium Nitrate (AN) shall be bagged in the Bagging Plant. The AN prills will be transported from the site in trucks using 25 kg, 50 kg bags or 1000 kg Jumbo bags. However, AN solution will be transported through tankers. Suitable means shall be utilized for transportation to other countries if product export is planned later. All precautions as per the latest Ammonium Nitrate Rules 2012 shall be taken during storage and transportation.

Market Use/Area

High Density Uncoated Prill Ammonium Nitrate (HDAN)

High Density Ammonium Nitrate (HDAN) has several applications in the industry. It is the main raw material required for the manufacture of high-quality emulsion and Slurry explosive. The uncoated HDAN can easily mix with water to form the Oxidizer solution, making it a preferred product amongst the explosives manufacturers. HDAN gives an enhanced performance as a major ingredient of emulsion matrix.

Low Density Porous Prill Ammonium Nitrate (LDAN)

Low Density Porous Prilled Ammonium Nitrate is a special porous free flowing product for use in the manufacture of ANFO (Ammonium Nitrate Fuel Oil) and Heavy ANFO product in Opencast Mining and construction projects. It is suitably used in dry or slightly watery holes. It is also used in Underground Metalliferous mines for stope and shaft blasting. The product of ANFO can be loosely poured and pneumatically charged depending upon the usage. Its low density and high porosity produce good oil absorption and high detonation speed.

Ammonium Nitrate Solution/Melt

Ammonium Nitrate Solution is used to produce ammonium nitrate-based emulsion explosive products. The AN melt is in liquid form of ammonium nitrate which is used for manufacturing emulsion matrix or blend and finally the Site Mix Emulsion. Ammonium Nitrate Solution takes less time to dissolve, hence the time taken for preparation of Oxidizer Blend is faster. The final product of Emulsion Explosives depends upon the concentration of the blend by adding water to the desired proportions. AN Melt is a very popular product for the Explosives manufacturers.

Concentrated Nitric Acid (CNA)

Concentrated Nitric acid (CNA) is largely used as strong oxidizing agent. It has application in manufacturing of colors, dyes, ink, explosives, laboratory chemicals and pharma intermediates. Current market demand and supply gap makes it attractive to manufacture concentrated nitric acid.

2. Existing

Raw materials required for production of Ammonia and Urea are given in **Table 9**.

Daily Urea production (MT)	Natural Gas per day@ 8500 Kcal/Sm3 (Sm3)
10800	**6676915**

Source of Natural Gas: GAIL

Source of Electric Power: Captive Power plant

Transportation

1. **Raw Material:** Natural gas, the main raw material, is available to the project site through pipeline from GAIL terminal at Vijaipur (MP).
2. **Finished product:** Finished product is being sold in domestic market in bagged Urea. The finished product is transported through Rail and trucks. The Rail yard exists within the plant for transportation of finished product all over India.

Storage

1. **Ammonia Storage:** Two double-walled integrally refrigerated atmospheric pressure storage tanks for ammonia are available. Each tank is having storage capacities of 5000 MT.
2. **Urea Storage:** The urea silo has capacity of 40,000 MT of urea.

3.5 Resource optimization/recycling and reuse envisaged in the project, if any, should be briefly outlined.

1. Proposed

CFCL shall endeavor to maximize reuse and recycle of resources. Such reuse and recycle shall further enhance plant performance, efficiencies and reduce resource consumption. Conservation methods planned for each plant are listed below:

Nitric Acid Plant

- Ammonia oxidation reaction is exothermic, and heat is generated in the process. This heat is recovered and utilized to generate steam in Waste Heat Boiler. Such generated steam is utilized in steam turbines coupled to Process Air Compressor and other pumps. Thus, electricity consumption in Nitric acid plant is reduced.
- Process condensate recycling will be maximized to reduce freshwater consumption.
- Tail gas energy is recovered through a gas expander and utilized to run the compressor train. This will reduce energy consumption in the compressor train.
- All process streams are pre-heated to utilize heat of process gases.
- Cooling water is used to preheat ammonia feed, thus reducing steam requirements.

Ammonium Nitrate Plant

- Process steam generated in reaction is utilized to preheat raw material like Ammonia, Nitric Acid and heating steam condensate.
- Entropic exchanger helps in treating the excess process steam to reduce Ammonium Nitrate content in the effluents.
- Direct contact scrubber used for cooling polluted air vent from dryer and pre-dryer and recycle in cooling process.
- Air stream leaving the top of the prilling tower is scrubbed and cooled in the prilling scrubber by means of AN solution, which is recycled and recovers most of the AN contained in the circulating air.

Concentrated Nitric Acid (CNA) Plant

- NOx gases generated in the plant are recovered as nitric acid in absorption tower.
- Magnesium Nitrate is recovered, regenerated and reused in the plant.
- Condensate is recycled for reuse.

2. Existing

- The wastewater generated from Urea plant containing Ammonia and urea is being treated in urea Hydrolyser to recover CO2 and ammonia from waste water. Recovered Ammonia and CO2 is being reused in the process. In Ammonia plant, the process condensate stripper has been provided to stripped off the Ammonia, CO2, methanol, etc. and recycled back to the process. Stripped condensate is being used as Boiler feed water make-up after polishing. Treated effluent from ETP is pumped to holding pond. This treated effluent conforming to norms is used for irrigation purpose in the green belt, lawns & gardens, in township & factory. Only during rainy season, the treated water of G-I +G-II plant from Holding pond is discharged to the Kalisindh River.

- Flue gas from Turbine is used as feed stock in HRSG plant for producing steam.
- Treated water from G-III plant is being reused in the process to reduce water consumption after treatment in RO-ZLD Plant. Thus G-III Plant is Zero liquid discharge plant.

3.6 Availability of water its source, energy/power requirement and source should be given

3.6.1 Water Source

As per EC:

Fresh requirement of existing plant is 52371 KLD which is being sourced from River Kalisindh.

After Expansion:

After proposed Expansion, the total freshwater requirement of whole plant will increase to 55251 KLD. Additional water required (2880 KLD) is mainly required for cooling tower make-up, domestic purpose, DM water preparation required for steam generation through heat recovery from the process plants. Maximization of recycle and reuse of condensate and other water streams will be incorporated in plant design to reduce the freshwater requirement.

Additional, fresh water will be sourced from existing plants within CFCL premises. Existing plants draw raw water from Kalisindh River, where rainwater is harvested and stored in riverbed. CFCL has agreements with Water Resources department for raw water offtake from riverbed. The total water drawn from this source shall be within current limits prescribed for existing plants. Total approved drawl quantity is 30 cusec water (20 + 10) equivalent to 73,440 KLD.

3.6.2 Electricity & Fuel Requirements

As per EC:

The power requirement of the existing plant (55 MW) is being met by inhouse Captive power plant and Grid supply. The power is being generated by Natural gas-based turbine. The flue gas from turbine is being used as feedstock in HRSG to generate steam for plant operations. Plant is also having additional source of power supply from state grid for backup. Emergency power generator sets of 1.6 MW, 2.5 MW and 2.4 MW capacity are installed to keep the most essential equipment inline in the event of temporary power failure and to provide a safe shutdown of the plants in case of prolonged power failure.

After Expansion:

After proposed Expansion, there shall be requirement of additional 5 MW power. Electrical supply will be supplied from State Electricity Grid. Part supply may be from existing captive generation if required. Additional, Emergency diesel generator (EDG) of 1.2 MW capacity shall be installed to meet power requirements of plants in emergencies like power failure etc.

The details of Power requirement and power backup are given in **Table 2.**

3.7 Quantity of waste to be generated (liquid and solid) and scheme for their management /disposal

3.7.1 Wastewater generation & Management plan

As per EC:

Industrial Effluent: The total effluent generation from existing plant is 11305 KLD. This effluent is treated in respective treatment facilities (ETP, RO-ZLD Plant). G-III effluent is treated in RO-ZLD Plant and permeate is recycled as cooling water make up. Treated effluent from G-I and G-II Plants is used for irrigation in green belt with in CFCL's premises or discharged into River Kalisindh only during rainy season as prescribed in amended EC dated 16/11/2021.

Domestic: Total domestic effluent from existing plant is 1272 KLD which is being treated in three nos. of STP and reused in gardening.

After Expansion:

After proposed expansion, total industrial effluent generation will increase from 11305 KLD to 12746 KLD. Proposed plant industrial effluent generation will be 1441 KLD, out of which 1440 KLD wastewater will be treated in new installed ZLD unit and recycled as cooling water make-up. Remaining 1 KLD oily wastewater effluent generated mainly from rotary equipment's in proposed plant will be collected and routed to oil separator in existing ETP for oil separation.

Additionally, 20 KLD domestic effluent will be generated from proposed new plants. After proposed expansion, domestic effluent will increase from 1272 KLD to 1292 KLD which will be treated in existing Sewage treatment plants and further disposal into irrigation network with the CFCL premises.

3.7.1.1 Process Description for Different Wastewater Treatment Schemes

1. **Proposed**

Process Condensate
Maximum quantity of process condensates shall be recycled within the plants. Process condensate generated in Ammonium Nitrate (AN) plants will be reused in Nitric acid plant and/or Prilling sections. Surplus quantities will be treated and used as cooling tower make-up. Process condensate generated within Concentrated Nitric acid plant will be utilized within the plants.

Turbine and Steam Condensate
Turbine condensate generated at different condensers of steam turbines and steam condensate from heat exchangers are pure streams and free from any contamination. These streams shall be recycled as Boiler feed water after adequate treatment.

Boiler water blowdown

Boiler water blowdown stream contains small amount of dissolved solid and phosphate. This stream will be used as cooling tower makeup water within the plants.

Cooling Tower blowdown / Side-stream filter backwash

Cooling towers blowdown and side-stream filter backwash effluent water will be treated in ZLD unit and reused as cooling tower make-up water.

Oily water

Very small quantity of oily wastewater will be generated from different rotary equipment of plants. Such small quantity will be collected in a pit and pumped to existing Oil separator unit for oil separation.

Rainwater / used fire-water

Normally such stream will not be generated, except in case of rains and fire water usage. If contaminated, liquid effluent will be collected and recycled through ZLD unit. Garland drains shall be provided with sluice gates to hold such water if contaminated.

Sewage effluent

Sewage effluent will be generated from plants and offices. This sewage will be collected and transferred to existing sewage treatment plants for treatment and reuse in irrigation network.

2. Existing

A systematic approach was followed to segregate the waste waters based on their characteristics.

a) Ammonia Process Condensate Treatment

In Ammonia Plant, process condensate is mainly of two types. Overhead condensate is available after condensation of moisture from the carbon-di-oxide in the overhead coolers. This condensate carries dissolved carbon-di-oxide. Other condensate is generated from process gas containing Ammonia and Methanol.

These condensates are treated in process condensate stripping unit Stripping is carried out with steam. Ammonia of this stripper is recycled back to primary reformer and bottom purified product is sent to water Demineralization Plant for further polishing. The polished water is recycled as Boiler Feed Water which reduces consumption of water and controls pollution. The design flow of this wastewater is 2208 M³/D.

During any upset in stripping section condensate is stored in a three days capacity Guard Pond for reuse. The stripper has extra capacity to take additional load.

The performance data are presented below:-

Parameter	Unit	Design		Actual Performance	
		Inlet	Outlet	Inlet	Outlet
Ammonia	Mg/l	500	10	450-500	2.5
Carbon-di-oxide	Mg/l	600	10	500-600	6

Methanol	Mg/l	1000	20	600-700	12

b) Urea Process Condensate

The process condensate of Urea plant contains Ammonia, Urea and carbon-di-oxide. The condensate treatment system is integrated in the process and is provided with a Hydrolyser to hydrolyze urea and recover Ammonia by distillation. Deep hydrolysis of Urea and proper stripping of Ammonia and Carbon-di-oxide give purified water suitable for recycling as boiler feed water. This not only helps in pollution control but also reduces consumption of water. Design flow of this water is 1368 m^3/ D.

As in Ammonia Plant, in case of any disturbance in treatment section, condensate is collected in Urea Guard Pond of three day capacity for reuse.

The Urea is subjected to thermal hydrolysis into Ammonia and Carbon-di-oxide under pressure. The Ammonia and Carbon-di-oxide are recycled to the process after stripping. The bottom purified water is sent to the water Demineralization Plant for further polishing to use as Boiler Feed Water. The average performance data are presented below:-

Parameter	**Unit**	**Design**		**Actual Performance**	
		Inlet	**Outlet**	**Inlet**	**Outlet**
Urea	Mg/l	500	10	450-500	2.5
Ammonia	Mg/l	600	10	500-600	5
Carbon-di-oxide	Mg/l	1000	20	600-700	5

c) Turbine Condensate

Turbine condensate generated at different condensers of steam turbines is pure and free of contamination. This is sent directly to water demineralization plant for use as boiler feed water after polishing.

d) Steam Condensate

Steam condensate from heat Exchangers of Urea Plant is used as Boiler Feed Water after polishing in the water Demineralization Plant.

e) Water Pre-treatment Plant

Two types of wastes are generated in water pre-treatment plant (WPT).

1. Clarifier sludge.
2. Sand filter back-wash.

Sludge generated from clarifier is in slurry-form and is taken to a centrifuge. Clear waste water is then taken to Effluent Treatment Plant or raw water reservoir as per the quality of the water. Solid cake from centrifuge consisting of mainly silt is sent to demonstration farm.

Sand filter back wash water does not contain high quantity of suspended solids. This water is again recycled to water pretreatment plant. Thus, entire quantity of wastewater (1092 M3/D) is recycled and solid cakes are reused in the demonstration farm.

f) Wastewater from Demineralization Plant

Demineralization Plant wastewater is generated due to regeneration of ion exchange resin columns. The wastewater is highly acidic or highly alkaline depending upon the regeneration cycle. This is taken to a neutralization pit for pH correction by mutual mixing. The neutralized wastewater is routed to the Effluent Treatment Plant.

g) Waste water from Laboratory

The small quantity of waste water that generates during the laboratory analysis is transported to the neutralization pit of water demineralization plant.

h) Cooling Towers

Two types of wastes are generated in Cooling Tower

1. Cooling Tower Blow Down
2. Cooling Tower Side Stream Filter Back-Wash water

Non-chromate cooling water conditioning system is practiced in all the cooling towers. The blowdown water contains 1200-1500 mg/L total dissolved solid and 4-8 mg/L phosphate. The blowdown water is routed to effluent treatment plant where it is mixed with other waste water.

Filters back wash water and cell basin blow down are also transported to the Effluent Treatment Plant.

i) Oily Waste water

Oily waste water from different sections in all Ammonia and Urea Plants is collected in a pit and then pumped to the Oil separator unit in Effluent Treatment Plant facility.

Flocculation of emulsified oil takes place by treatment with alum and polyelectrolyte. Oil layer on the top is skimmed out and collected in drums. Clear waste water is taken to Effluent Treatment Plant. Oily sludge generation is very small. It is collected in drums and composted in Demonstration farm.

Final Effluent Management

a) Effluent Treatment plant

The waste waters from various sources as indicated earlier arc transferred to Effluent Treatment Plant (ETP). Here, pH control and stabilization of waste waters take place. Different effluent streams as described above get thoroughly mixed in six compartments of mixing chamber. From mixing chamber effluents flow into a stabilization section followed by settling tank. Sedimentation of the suspended particles takes place in the settling tank.

The treated wastewater of the effluent treatment plant is pumped to the two large Holding Ponds.

b) Holding Ponds

The total capacity of two holding ponds (HP) is 90000 cubic meter each. These ponds are suitable for retaining treated wastewater for more than three months. Most of the treated effluent water from Holding Pond is sent to the Reverse osmosis plant and irrigation network except during monsoon when it is discharged to Kalisindh riser. This is discharged through two six km long underground HDPE pipeline having diffusers anchored on the riverbed.

Treated wastewater of the Holding Pond always complies with the standards of the Rajasthan State Pollution Control Board & Environment Protection Act Rules.

Block Diagram of Existing ETP is given in **Figure 19.**

c) Sewage Treatment and Disposal Scheme

Total Sewage generation from all plant and colony is about 1000 M^3/day which is treated in three no's STP plants. For phase-I & II plants the adopted sewage Treatment scheme is based on extended aeration process and clarification in clarifier and tube settler respectively.

In phase-III plant, in addition to extended aeration process. The equalized sewage is pumped into the Anoxic tank forwarded by MBBR tank where biological treatment on the sewage takes place. It is also provided with diffuser system at the bottom of the Tank for aeration and with MBBR media for enhanced surface area for microbial development. Aeration helps in maintaining the Dissolved oxygen levels in the reactor. The MLSS (Mixed Liquor Suspended Solids) carry out the biological degradation of the effluent. The overflow is taken in the Secondary Clarifier where clarification of the liquid takes place. The overflow from the Secondary Clarifier is sent to the clarified water tank where sodium hypochlorite is dozed for disinfection purposes. This disinfected water is then pumped though a pressure sand filter and subsequently through an activated carbon filter where the color and odor from the sewage is removed. The treated water from ACF to pass through UV system to remove the traces of organic. This treated water is used for horticulture purpose.

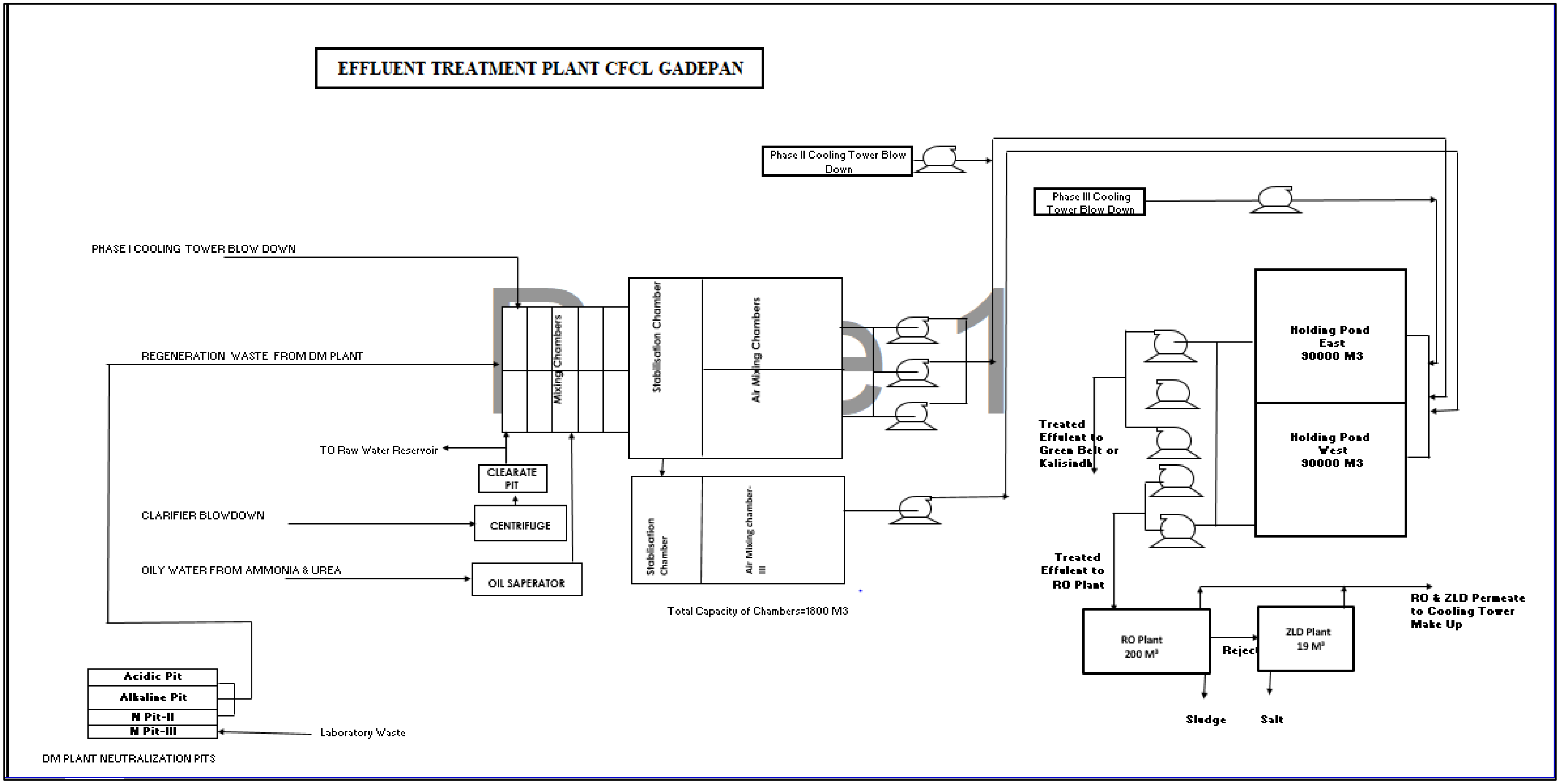


Figure 19: Block Diagram of Existing ETP System

d) Reverse Osmosis Plant

4800 KLD Reverse Osmosis plant is installed to treat all Phase-III effluent along with some Phase-1 & Phase-2 effluent.

The HP effluent is pumped to the Stilling Chamber with Oil & Grease Trap. A slotted pipe skimmer has been provided to remove the floated oil layer. Effluent from stilling chamber outlet is entered in the Flash Mixing Chamber; here Lime/Dolomite solution, hypo, PE, soda ash and coagulant are dosed for silica & hardness reduction. The solids formed during the chemical reaction are separated in the clarification zone of downstream High Rate Solids contact Clarifier (HRSCC). The clarified water from the outlet of HRSCC is collected in the Clarified Water Tank and pumped to the Dual media Filters & Activated Carbon Filter followed by UF for further treatment.

The settled sludge from HRSCC is periodically drained to the Sludge Pit. Sludge from sludge pit is pumped to a Centrifuge for further sludge dewatering. Centrate from Centrifuge is led to Flash Mixing Chamber. The dewatered sludge from Centrifuge outlet is disposed to TSDF Udaipur.

Filtered water from the ACF is fed to Ultra Filtration unit to reduce the fine suspended / colloidal impurities. UF unit is back flushed automatically based on pre-set frequency. The Ultra filtration membranes are back-flushed by UF permeate water. Permeate from the ultra-filtration system is collected in UF Permeate Tank.

UF permeate from UF Permeate Tank is passed through the Micron Cartridge Filter of 5 Micron nominal rating for further fine (micron) filtration prior to RO inlet.

Provision of Antiscalent and HCl, Sodium Meta bi-sulphite dosing prior to Cartridge Filter has been made for dechlorination. The cartridge filtered water is pumped to the RO-I block using HP pumps. Permeate from RO-I is collected to common RO Permeate Tank. RO-I reject is led to RO-I Reject Tank and passed through RO-II skid by reject RO-II feed pump.

RO-I Reject is passed through the Micron Cartridge Filter of 5 Micron nominal rating for further fine (micron) filtration prior to RO-2 inlet

The reject from RO-I reject tank is pumped to the RO-II block using HP pumps. Permeate from RO-II is collected to RO Permeate Tank. This permeate is used as cooling tower make up.

RO-II reject is led to MEE (Multi Effect Evaporator) Feed Tank.

e) ZERO LIQUID DISCHARGE

456 KLD Zero Liquid Discharge plant is installed to treat RO reject. RO Reject is concentrated in Five Effect Evaporator followed by Pusher Centrifuge. Feed is flow in forward feed manner in evaporators. All effects are Forced Circulation type.

RO reject from MEE feed tank is transferred by MEE feed pumps. The feed is preheated by series of pre heaters. First the feed enters the Preheater–1 where the feed is heated by process condensate. From Preheater-I feed enters to next preheater-2 where the feed is heated by the partial vapors from calendria -5 and so on.

After preheater-6 the feed enters into the first effect in duct of vapor liquid separator for Effect-1. When the desired level in Vapour Liquid Separator (VLS-1) is reached than RO reject is kept in recirculation by starting pump to maintain tube side velocity and to achieve desired heat transfer coefficient. The same pump is used for recirculation and to transfer RO reject to next effect. Similarly, when the desired level in VLS-2 is reached the RO reject shall be transferred to next stage up to 5th stage. Finally RO reject is collected in Thickener tank, where pusher centrifuge is separate out salts and mother liquor. Mother liquor is recycling back to 5th stage VLS.

Saturated steam is fed to the inlet of Ejector as a motive fluid. Partial Vapors from effect I is sucked by Ejector to mix up with live steam which is given to shell side of 1st effect calendria. The effluent mass which is in recirculation through calendria –1 is flashed in Vapor liquid separator-1.

The vapors generated in Vapor liquid separator-1 is go for next Calendria-2 and so on. Finally vapour from VLS-5 is entering in Surface condenser where vapour is condensed by cooling water and is mixed up with process condensate of Calendria-5. This is final product of ZLD plant. Whole plant is running under vacuum.

The outlet characteristics of different treatment scheme is given below in **Table 11.**

Table 11: Outlet Characteristics of ETP

Parameter	Unit	DM Plant	Cooling Tower	ETP	Holding Pond
pH (at 25 degC)	---	6.4	7.5	7.1	7.6
COD	mg/l	78.9	26.5	75.3	74.3
BOD (3 days at 27 degC)	mg/l	16.2	14.2	13.7	13.3
Total Suspended Solids	mg/l	86.4	11.2	9.5	12.6
Oil & Grease	mg/l	0.37	0.54	0.73	0.96
Free Available Chlorine	mg/l	*BDL	0.2	0.1	*BDL
Zinc and Zn	mg/l	0.004	0.36	0.24	0.16
Phosphate as P	mg/l	0.86	1.87	1.35	1.48
Ammonical Nitrogen as N	mg/l	6.4	0.36	9.3	13.8
Total Kjeldhal Nitrogen	mg/l	22.3	26.9	26.7	28.6
Nitrate Nitrogen as N	mg/l	4.5	5.6	6.1	6.9
Free Ammonical Nitrogen	mg/l	0.21	0.01	0.34	0.55
Iron as Fe	mg/l	0.26	0.19	0.27	0.36
Arsenic as As	mg/l	*BDL	*BDL	*BDL	*BDL
Hexavalent Chromium as Cr+6	mg/l	*BDL	*BDL	*BDL	*BDL
Total Chromium as Cr	mg/l	*BDL	*BDL	*BDL	*BDL
Cyanide as CN	mg/l	*BDL	*BDL	*BDL	*BDL
Vanadium as V	mg/l	*BDL	*BDL	*BDL	*BDL

*BDL Below Detection Limit

3.7.2 Solid & Hazardous waste generation & Management plan

There will be slight increase in the Municipal waste/Hazardous waste/Industrial waste from proposed plant which will be disposed as per applicable norms. There is generation of different kind of Industrial wastes from production process and other activities. Hazardous waste is being sent to Authorized Recycler/TSDF site while other solid wastes are segregated in recyclable/salable and non-salable/non-recyclable waste. Salable/recyclable waste are sold to approved recycler/vendor and non-salable/non-recyclable waste sent to Udaipur, TSDF.

Details of Waste generation are given below in **Table 12.**

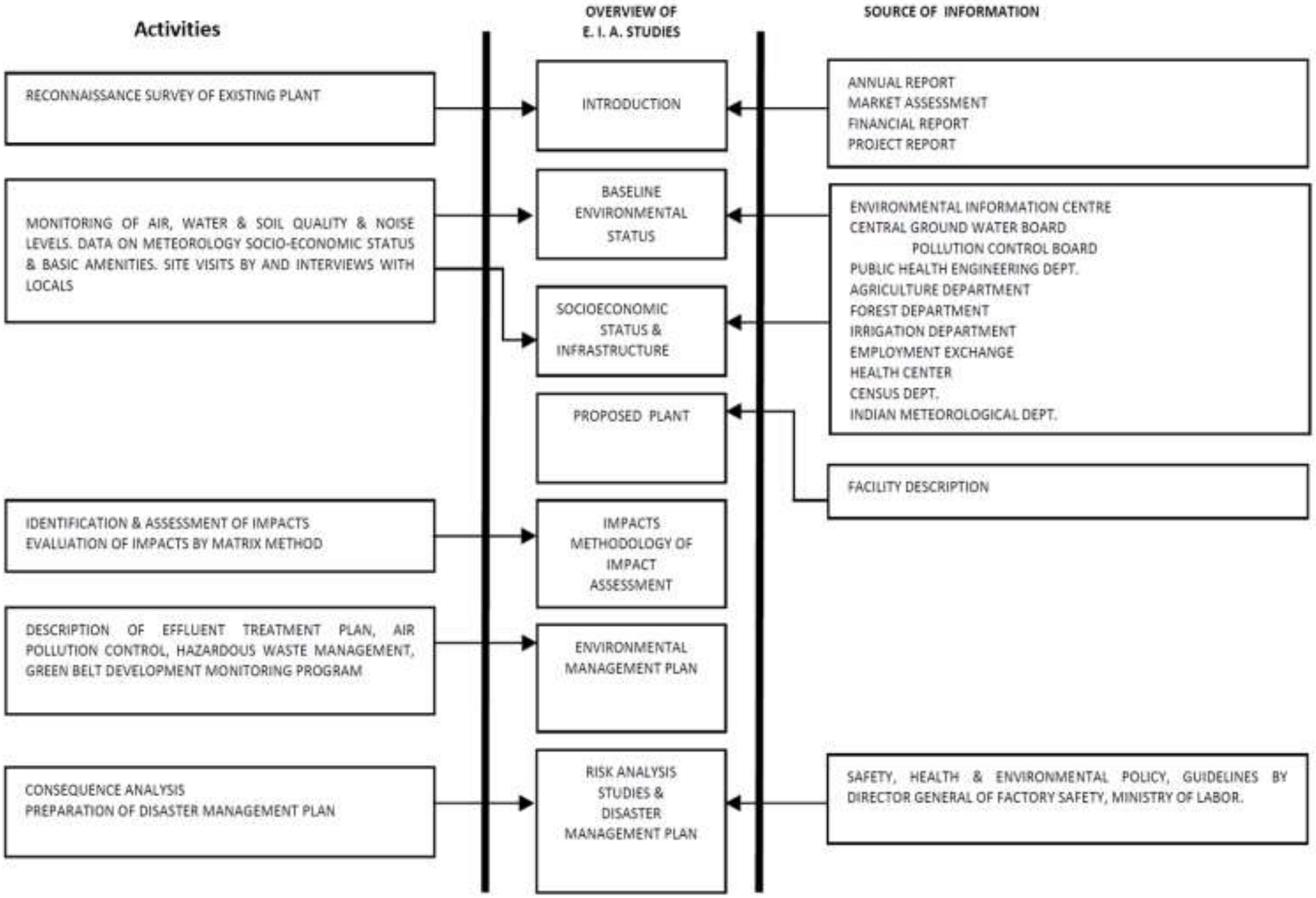
Table 12: List of Hazardous Waste

Sr. No	Name of Waste	Source of Generation	Category	As per EC	Proposed/ Additional	After Expansion	Disposal Method
1	Discarded containers, drums	Receipt, storage and handling of raw / packing materials	Sch-I/33.1	1000 nos. per year	500 nos. per year	1500 nos. per year	Collection in drums, storage and transportation to authorized recyclers / authorized TSDF.
2	Used/Spent Oil	Process / rotary machines / transformers	Sch-I/5.1	107 MTPA	20 MTPA	127 MTPA	Collection in drums, storage, transportation and sales to authorized recyclers.
3	Spent Catalyst	Process	Sch-I/18.1	660 MTPA	0.2 MTPA	660.1 MTPA	Regeneration / Recycle through catalyst supplier
4	NOx abatement Spent Catalyst	Nitric Acid Plant	Sch-I/18.1	0	10 MT in 5 years	10 MT in 5 years	Collection in drums, storage and transportation to authorized recyclers / authorized TSDF.
5	Chemical sludge from wastewater treatment	Wastewater treatment schemes	Sch-I/35.3	17000 MTPA	900 MTPA	17900 MTPA	Chemical Sludge from wastewater treatment scheme is being disposed to cement plants for co-processing / TSDF, Udaipur
6	Contaminated cotton waste or other cleaning materials	Maintenance and cleaning activities	Sch-I/33.2	12 MTPA	5 MTPA	17 MTPA	Collection, storage and transportation to Common incinerator

-

- The municipal solid waste generation at the plant area and township is being segregated in biodegradable waste and recyclable waste. Recyclable waste is being sold off to authorized vendors. Biodegradable waste is being feed to onsite Bio-gas plant. The biogas is used for cooking in CFCL Guest House, and the liquid manure is used for horticulture. The filtered liquid is recycled back into the digester. Same practices shall be followed in the proposed plant.
- Minor E-waste and Battery waste are also generated from the Plant which is disposed as per E-Waste (Management) Rules, 2016 and Battery Waste Management Rules, 2020 respectively. Waste from Dispensary are disposed as per Bio-medical Waste Management Rules, 2016.

3.8 Schematic representations of the feasibility drawing which give the information of EIA purpose



4 SITE ANALYSIS

4.1 Connectivity

- Nearest railway station*: Bhonra Railway Station: 1.47 Km, NNW
- Nearest highway: NH-27 (earlier NH-76) adjacent to site in North Direction
- Nearest Airport: Jaipur –250 Km, NNW

**All distances are Aerial Distance.*

Figure 20: Connectivity of plant

4.2 Land Form, Land Use and Land Ownership

The project site is in possession of CFCL. The present land use of the site is Industrial. No further change in land use is proposed. No additional land is proposed.
Total Land: 400 Ha

4.3 Topography

Topographically the area is flat terrain, and the elevation of the proposed plant site (TAN plant) is between 247-252 m above Mean Sea Level. The topographical map showing the project site and the environment sensitivity is shown in **Figure 21.**

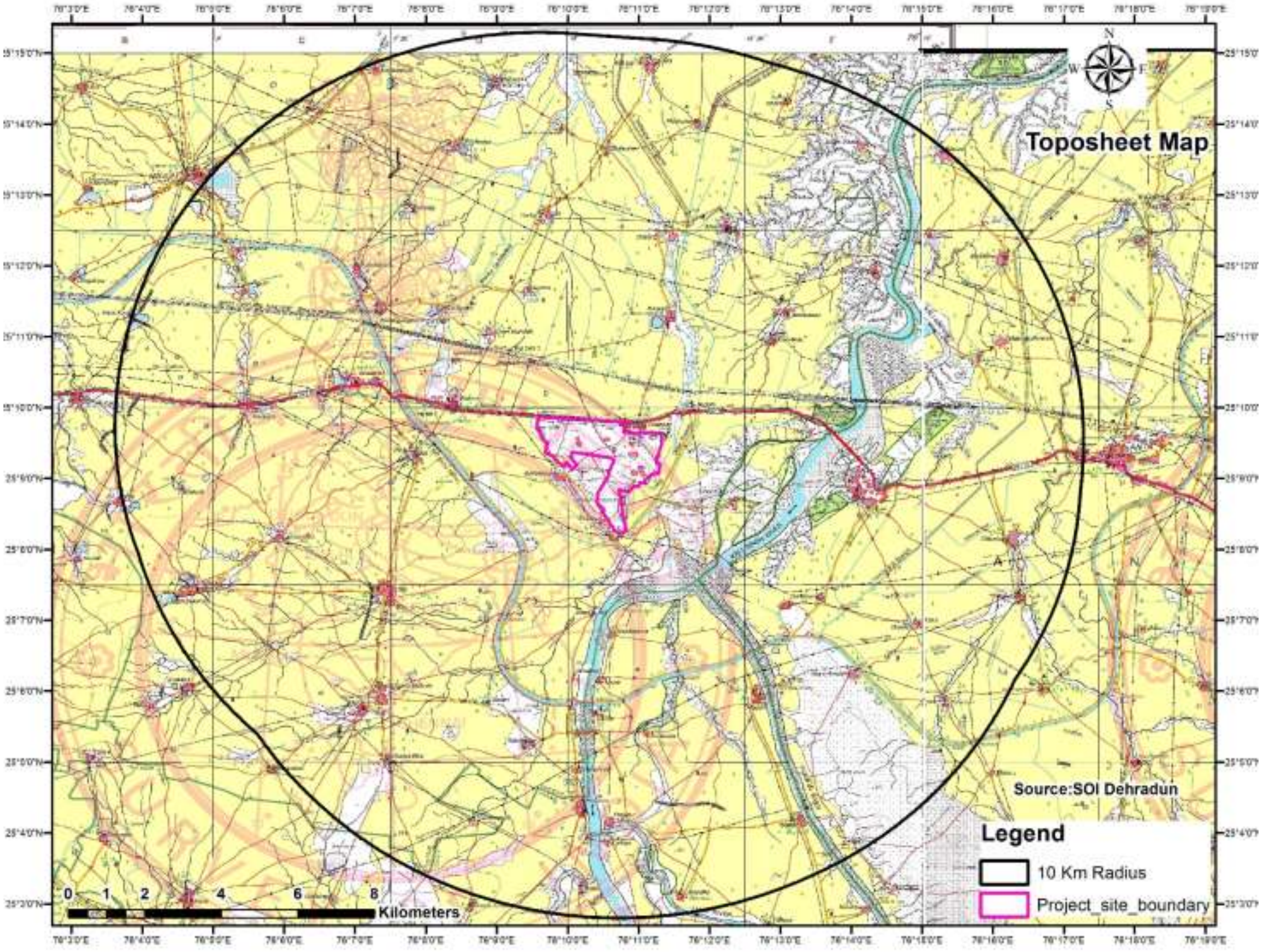


Figure 21: Topographical map showing the Project site

4.4 Existing land use pattern

The existing land-use and land cover pattern of the site is industrial. The CRZ clearance is not applicable to the proposed Industry.

4.5 Existing Infrastructure

The project site is very well connected to NH-27 and with rail connectivity. Internal road and other infrastructure are already developed inside the plant. Apart from Plant utility and manufacturing area, ,Lab Canteen, admin, Township, drinking water, Water treatment, etc facilities are provided within the CFCL premises.

All the other required utilities like steam, power, cooling water, boiler, etc. is available in the Plant. No additional facility is envisaged in the proposed project.

4.6 Soil Classification

Soils in the region are mostly sandy clay loam. The microbial quality of soil is normal and shows no contamination. The pH is neutral and average bulk density of soil is approximately 1.25 g/cc and shows the status of normal agriculture soil. Water holding capacity (WHC) ranged between 32 to 36%.

4.7 Climatic data from secondary sources

Historical meteorological data are obtained from climatological tables pertaining to Kota, Rajasthan (as per the nearest representative IMD station) for the period of 1981-2010, are given below in **Table 13.**

Table 13: Climatological Data

Month	Temperature (oC) Daily		Relative Humidity (%)		Rainfall (mm)	Rainy Days	Predominant Wind Direction (From)	Calm Period		Cloud Amounts (all cloud)	
	Max	Min	08:30	17:30				08:30	17:30	08:30	17:30
January	24.5	9.3	63	38	3.9	0.3	NE	63	65	1.4	1.4
February	27.8	12.4	51	30	2.3	0.2	NW	58	61	1.3	1.5
March	33.8	18.0	37	22	3.8	0.4	NW	63	44	1.5	2.0
April	38.9	24.3	29	18	0.7	0.1	NW	44	42	1.5	2.4
May	41.8	28.1	31	20	6.9	0.6	NW	25	32	0.8	1.9
June	40.2	28.1	52	38	57.5	3.4	W	11	20	2.6	3.9
July	34.6	25.3	72	62	272.8	9.8	W	23	20	5.7	6.0
August	32.0	24.4	80	74	249.1	10.9	W	21	30	6.1	6.4
September	33.4	23.9	72	60	90.5	4.7	W	29	43	3.4	4.1
October	34.7	20.6	56	37	15.3	0.6	NW	64	77	0.9	1.4
November	31.0	14.9	56	36	9.3	0.6	NW	76	79	1.3	1.3
December	26.0	10.7	63	42	4.7	0.3	NW	65	72	1.6	1.5

4.8 Social Infrastructure available

The Social infrastructure is available within and near the site, details are given below in **Table 14.**

Table 14: Social Infrastructure near the site

Features	Description
Near-by Residential Area	• CFCL Township within CFCL premises. • Village Gadepan (adjacent to CFCL premises in NNE direction) • Village Ballabhpura (adjacent to CFCL premises in SSW direction)
Nearest Educational institute	• CFCL DAV public school within CFCL premises. • Adarsh Govt. Senior Secondary School Gadepan (0.05km, E)
Nearest Hospital	• CFCL dispensary within CFCL premises • Public Health Centre, Gadepan Village (3 Km, N) • Govt Hospital, Anta (10.7 Km, E) • ESI Hospital, Kota (30.8 Km, WSW)

5 PLANNING BRIEF

5.1 Planning Concept (type of industries, facilities, transportation etc.) Town and Country Planning/Development authority classification.

The proposed project is located at Village and post office Gadepan of Kota district (Rajasthan). Project conform the T&CP and other authority classification.

5.2 Population Projection

During construction phase, construction workers strength will be around 3000 nos. (Peak) and about 2000 (average basis). These construction workers shall stay in surrounding areas, where adequate residential facilities are available.

During operational phase, after project implementation and commissioning, about 150 persons per day (100 permanent + 50 contractual) shall work.

5.3 Land use Planning (breakup along with green belt etc.)

The land distribution of the project is shown in **Table 15** below

Table 15: Land use Breakup

S No.	Description	Area (Hectare)	Percentage (%)
1.	Plant areas *(Including proposed 6 Ha Plant area)*	187.0	46.8%
2.	Township	76.5	19.1%
3.	Green belt	136.5	34.1%
	Total	**400.0**	**100.0%**

5.4 Assessment of Infrastructure Demand (Physical & Social)

Almost all basic facilities and infrastructure are available within the CFCL premises. Surrounding areas also have similar facilities.

CFCL has provided township within the premises. The township has well-designed houses, excellent medical facilities, health club, swimming pool, a CBSE affiliated school, shopping centre, sports and great options for sports and recreation.

It is set amid an amazing green environment with a rich diversity of flora and fauna. Green avenues with rows of trees, rolling lawns and water bodies are a now an integral part of the township. CFCL township maintains highest safety and environment standards and has been awarded Environment Management System Standard ISO 14001 and the Occupational Health and Safety Management System Standard ISO 45001 certifications.

5.5 Amenities/Facilities

Proper site services such as First Aid with Medical Dispensary, residential area, Canteen, Drinking Water, Training Facilities, Bank etc. are provided to the workers.

6 PROPOSED INFRASTRUCTURE

6.1 Industrial Area (processing area)

187 Ha land is allocated for Main plant area. Proposed TAN plant shall be installed in 6 Hectare of vacant land available within the existing CFCL premises. Details are given in Section 1.1.

6.2 Residential Area (non-processing area)

CFCL has provided township within the premises in an area of 76.5 Hectare. The township has well-designed houses, excellent medical facilities, health club, swimming pool, a CBSE affiliated school, shopping centre, sports and great options for sports and recreation.

6.3 Green belt

34.1% i.e., 136.5 ha area of total plot area is developed as green belt. More than 50m wide green belt is provided all around the boundary wall of project site. The industry has put in serious effort to create the greenery and the number of trees, plants, shrubs and herbs has increased considerably.

6.4 Social Infrastructure

CFCL is already undertaking activities for the development of the surrounding area. i.e., improving water supply, financial and managerial assistance to schools, promotion of sports activities, improving sanitation, giving medical care facilities, health camps, farming awareness and other social work.

The Company has formulated a Corporate Social Responsibility Policy ("CSR Policy") which outlines the guiding principles and mechanism for undertaking socially useful programs for benefit of the community in and around its area of operations and other parts of the country.

The Company, inter-alia, aims to:

(a) Work towards improving the quality of life by making the communities self-reliant in areas within which it operates;

(b) Promote sustainable farming practices to boost crop productivity in rural India through its soil testing facilities and other advisory services; and

(c) Build lasting social capital through interventions in the rural development, healthcare, education, vocational training and other social initiatives for the community residing in the vicinity of its plants and other places in India.

The Corporate Social Responsibility ("CSR") projects and programs of the Company cover wide spectrum of activities in the areas of Education including Technical & Vocational Education, Rural Development, Health care, Employability & Empowerment and Soil Health.

The CSR Projects / Programs of the Company in the area of Education are focused on providing quality education to the children in and around its plants including improvement of standard of education and infrastructure development in Government schools and Industrial Training Institutes adopted by the Company.

The Company also works towards skill development and vocational training in order to enhance the employability of rural youth and making them self-reliant.

Under Rural Development initiative, the Company's CSR Projects / Programs are aimed at sustainable development of village infrastructure for well-being of the community at large.

Under the Health care initiative, the Company helps the community through medical facilities including doorstep delivery of medical care services in remote areas, preventive health care, awareness campaigns, general and specialized health camps, etc. In order to achieve gender equality and promote income generating activities for the marginalized section of women, the Company supports Women Self Help Groups.

Farming community, especially small and marginalized landholders, are supported through soil testing laboratories, mobile soil testing vans and advisory services to ensure optimum use of agriculture inputs

6.5 Connectivity

Project Site is well connected to NH-27, Rail network and other public transport means.

6.6 Drinking water management (source & supply of water)

The existing drinking water facilities are adequate to meet demands of the proposed project. Potable water is available at various locations within the CFCL premises. Drinking water supply is provided from River Kalisindh after pre-treatment in Water Treatment Plant. A dedicated water tank/line will be provided to meet the potable water requirement.

6.7 Sewerage system

Existing:

Sewerage generation from site is domestic in nature and treated in three no. of inhouse STPs. The treated water from STPs is being used in horticulture after meeting the prescribed norms.

Proposed:

Sewage effluent from proposed plant and offices will be generated. This sewage effluent will be collected in a pit and pumped to existing Sewage treatment plants for treatment and further disposal into irrigation network with the CFCL premises.

6.8 Industrial waste management

Industrial hazardous wastes are being sent to authorized recycler or TSDF site. The brief of Industrial hazardous waste is mentioned in **section 3**

6.9 Solid Waste Management

The municipal solid waste generation at the plant area and township is being segregated in biodegradable waste and recyclable waste. Recyclable waste is being sold off to authorized vendors. Biodegradable waste is being feed to onsite Bio-gas plant. The biogas is used for cooking in CFCL Guest House, and the liquid manure is used for horticulture. The filtered liquid is recycled back into the digester. Same practices shall be followed in the proposed plant.

6.10 Power requirement & supply/ source

As per EC:

The power requirement of the existing plant (55 MW) is being met by inhouse Captive power plant and Grid supply. The power is being generated by Natural gas-based turbine. The flue gas from turbine is being used as feedstock in HRSG to generate steam for plant operations. Plant is also having additional source of power supply from state grid for backup. Emergency power generator sets of 1.6 MW, 2.5 MW and 2.4 MW capacity are installed to keep the most essential equipment inline in the event of temporary power failure and to provide a safe shutdown of the plants in case of prolonged power failure.

After Expansion:

After proposed Expansion, there shall be requirement of additional 5 MW power. Electrical supply will be supplied from State Electricity Grid. Part supply may be from existing captive generation if required. Additional, Emergency diesel generator (EDG) of 1.2 MW capacity shall be installed to meet power requirements of plants in emergencies like power failure etc.

7 REHABILITATION AND RESETTLEMENTS (R& R) PLAN

7.1 Policy to be adopted (central/state) in respect of the project affected persons including home oustees, land oustees and landless labors (a brief outline to be given)

CFCL premises is spread over an area of 400 Ha, within which there is adequate space available to locate the proposed project. No additional land is proposed. Hence, any planning with respect to rehabilitation & resettlement is not applicable.

8 PROJECT SCHEDULE AND COST ESTIMATE

8.1 Likely date of start of construction and likely data of completion (time schedule for the project to be given)

Project construction will be started after obtaining all necessary approvals from the authorities. After start of construction, it will take around 24-30 months to complete the construction.

8.2 Estimated project cost along with analysis in terms of economic viability of the project.

Estimated project cost of proposed plant is Rs. 1170 Crore including cost of environment control systems. Project investment is found to be economically viable.

9 ANALYSIS OF PROPOSAL (FINAL RECOMMENDATIONS)

9.1 Financial and social benefits with special emphasis on the benefit to be local people including tribal population, if any, in the area.

- Project will enhance domestic production of Weak Nitric acid (WNA), Technical Ammonium Nitrate (TAN) and Concentrated Nitric acid (CNA).
- Local production and sales will generate revenue to the state of Rajasthan.
- Project will generate employment (direct and indirect) in the state.
- Project implementation and operation phase activities will provide additional earning opportunities to the local population in surrounding villages through various business activities.

Based on positive impact on local people and state of Rajasthan, it is recommended to implement the proposed project. Proposed project will result into import substitution. Import substitution will further boost "Atmanirbharta" initiatives, being promoted by the Government of India.

ANNEXURE- 1: Latest Environmental Clearance Letter

By Speed Post/Online

File No: J-11011/664/2008-IA II(I)
Government of India
Ministry of Environment, Forest and Climate Change
(Impact Assessment Division)
***

Indira Paryavaran Bhawan
Jorbagh Road, New Delhi - 110003

Dated: 16th November, 2021

To,

M/s Chambal Fertilisers and Chemicals Ltd.
P.O Gadepan, District Kota,
Rajasthan – 325208
Email: upendra.singh@chambal.in

Sub.: Amalgamation and Amendment of Environment clearances (EC) of CFCL Phase-I&II and Phase-III plants i.e. Ammonia (6100 MTPD), Urea (10800 MTPD), Captive Power Plant (55 MWH), Steam HRSG (240 TPH), Steam Boiler (320 TPH) by M/s Chambal Fertilisers and Chemicals Limited (CFCL)- Amendment in Environment Clearance regarding.

Sir,

This has reference to your online proposal No. IA/RJ/IND3/223492/2021 dated 27th September, 2021, for amendment in the environmental clearance granted by the Ministry vide letter of even no. dated 18th June, 2021 for the above mentioned project.

2. The Ministry of Environment, Forest and Climate Change has examined the above proposal for amendment in the environmental clearance granted by the Ministry vide letter dated 18.06.2021 in favour of M/s Chambal Fertilisers and Chemicals Ltd for amalgamation of the project viz. CFCL Fertilizers Plant, Gadepan, Kota, Rajasthan.

3. The proposal was considered by the Expert Appraisal Committee (Industry-3 Sector), in the Ministry, in its meeting held during 5-6 October, 2021. The Committee, after deliberations, has recommended the proposed amendments in the said environmental clearance, in the following manner:

Para 13 (b) shall be revised and read as under:

" The discharge from G-I and G-II plant in the Kalisindh River be permitted only during the rainy season when the precipitation value is more than 5 mm in a day and its succeeding 10 days (max) depending on the rainfall, after *meeting the stringent norms as prescribed.*

S. No.	Rainfall in a day (mm)	No. of succeeding days for treated effluent discharge to river after rainfall (days)
1	5	1
2	10	2
3	Greater than 20 mm and less than 75	5
4	Greater than 75 mm	10

During non-monsoon season, when precipitation is less than 5 mm in day (threshold value), the discharge from G-I & G-II plant in the Kalisindh River is not permitted and shall *be **ZLD system for river discharge. However, treated effluent (other than Ammonia Urea Process effluent) meeting the Standard for land discharge, can be used for irrigation in greenbelt within CFCL's premises.***

The Committee further recommended that the concerned State Pollution Control Board from time to time shall monitor discharge from G-I & G-II plant in the Kalisindh River and ensure strict compliance of the same and report this non-compliance, if any, to this Ministry. The State Pollution Control Board shall also ensure that the river water quality remains un-deteriorated".

4. The matter has been examined in the Ministry and based on recommendations of the EAC (Industry 3 Sector), **the Ministry of Environment, Forest and Climate Change hereby accords approval to the proposed amendments in the environmental clearance dated 18th June, 2021, as stated in para 3 above,** for the project ''CFCL Fertilizers Plant", Gadepan, Kota, Rajasthan.

5. All other terms and conditions stipulated in the environmental clearance dated 18th June, 2021 shall remain unchanged.

6. This issues with the approval of the Competent authority in the Ministry.

(Dr. R. B. Lal)
Scientist 'E'/Additional Director
Tele-fax: 011-24695362
Email-rb.lal@nic.in

Copy to:-

1. The Secretary, Forests & Environment Department, Government of Rajasthan, Vaniki Path, Near Secretariat, Jaipur-302005
2. The Deputy Inspector General of Forests (C), Ministry of Env., Forest and Climate Change, Integrated Regional Office, Jaipur, A-209&218, Aranya Bhawan, Mahatma Gandhi Road, Jhalana Institutional Area, Jaipur – 304002, Rajasthan
3. The Member Secretary, Central Pollution Control Board Parivesh Bhavan, CBD-cum-Office Complex, East Arjun Nagar, Delhi -32
4. The Member Secretary, Rajasthan State Pollution Control Board, 4, Jhalana Institutional Area, Jhalana Doongri, Jaipur, Rajasthan 302004
5. The Member Secretary, Central Ground Water Authority, Jamnagar House, 18/11, Man Singh Road Area, New Delhi, Delhi 110001
6. The District Collector, District Alwar, Rajasthan
7. Guard File/Monitoring File/Website/Record File/Parivesh Porta

(Dr. R. B. Lal)
Scientist 'E'/Additional Director
Tele-fax: 011-24695362
Email-rb.lal@nic.in

सत्यमेव जयते

By Speed Post/Online

F. No. J-11011/664/2008-IA II (I)
Government of India
Ministry of Environment, Forest and Climate Change
Impact Assessment Division
***

Indira Paryavaran Bhawan,
Vayu Wing, 3rd Floor, Aliganj,
Jor Bagh Road, New Delhi-110 003

Dated: 18th June, 2021

To,

M/s Chambal Fertilisers and Chemicals Ltd.,
P.O Gadepan, District Kota,
Rajasthan

Email: upendra.singh@chambal.in

Sub: CFCL Fertilizer Plant, Gadepan by M/s Chambal Fertilisers and Chemicals Ltd. located at P.O Gadepan, District Kota, Rajasthan- Amalgamation and Amendment in Environment Clearances - regarding

Ref: (i) Ministry's letter No. J-11011/2/1996-IA II(I), dated 24.07.1996

(ii) Ministry's letter No. J-11011/152/2006-IA.II (I), dated 21.05.2007 and subsequently amended on 18.09.2007

(iii) Ministry's letter No. J-11011/664/2008-IA.II (I), dated 22.04.2010 and subsequently amended on 10.06.2011

(iv) Ministry's letter No. J-11011/664/2008-IA.II (I), dated 22.06.2015 for extension of validity of Environmental clearance

Sir,

This has reference to your online proposal No. IA/RJ/IND3/193237/2021, dated 20th January, 2021 for amalgamation of environmental clearances granted by the Ministry vide letters dated 24.07.1996, 21.05.2007, 18.09.2007, 22.04.2010, 10.06.2011, 22.06.2015 in favour of M/s Chambal Fertilizers and Chemicals Ltd. (CFCL) and amendment in environmental clearance for the project Expansion of Fertilizer and Chemicals Unit at Gadepan, Kota, Rajasthan by M/s Chambal Fertilizers and Chemicals Ltd. (CFCL).

2. The details of the earlier environmental clearances granted to M/s Chambal Fertilizers and Chemicals Ltd and the details of the amendment sought is as under:-

S. No.	Plant/ Equipment/ Facility	Existing Configuration	Proposed Configuration	Final configuration after amendment	Remarks
1	Urea (G-III)	4000 MTPD ***(EC dated 10.06.2011)***	200 MTPD	4200 MTPD	Increase in production by 200 MTPD (Shifted from G-II)
2	Ammonia (G-I	3900 MTPD	(-) 150	3750 MTPD	Reduction in

	+ G-II)	***(EC dated 18.09.2007)***	MTPD		production of G-II and shifting the same to G-III Plant
3	Aux Boiler-III Steam (G-II)	160 TPH	0	160 TPH	No Change
4	Ammonia (G-III)	2200 ***(EC dated 10.06.2011)***	150	2350	Increase in production by 150 MTPD (Shifted from G-II)
5	Captive Power Plant (G-I)	37 MWH	0	37 MWH	No Change
6	Plot Area for expansion	400 Ha ***(EC dated 18.09.2007)***	0	400 Ha	No Change
7	Urea (G-I + G-II)	6800 MTPD ***(EC dated 18.09.2007)***	(-) 200 MTPD	6600 MTPD	Reduction in production of G-II and shifting the same to G-III Plant
8	Captive Power Plant (G-III)	18 MWH ***(EC dated 10.06.2011)***	0	18 MWH	No Change
9	HRSG-III Steam (G-III)	100 TPH ***(EC dated 10.06.2011)***	0	100 TPH	No Change
10	HRSG-I + HRSG-II Steam (G-I)	140 TPH	0	140 TPH	No Change
11	Aux Boiler-I + Aux Boiler-II Steam (G-I)	160 TPH	0	160 TPH	No Change

3. M/s CFCL Gadepan plant having three operational units i.e. Gadepan I, II & III. The plants were commissioned in 1994, 1999 and 2019, respectively. Latest environmental clearance was granted by this Ministry for the expansion of project by setting up G-III unit within the existing plant premises vide letter no. J-11011/664/2008-IA II (I) dated 22.04.2010, amended (corrigendum) in EC issued on 10.06.2011 and validity extension was issued on 22.06.2015. All three plants are operational and has valid CTO granted by RSPCB.

4. The total project cost including environmental controlling equipment's is Rs. 9136 Crores (G-1:1982 Cr, G-II:1214 Cr, G-III:5940 Cr). No additional cost is envisaged in the proposed proposal. Total Employment in the plant is 1020 persons.

5. After Amalgamation and Amendment, the total water and freshwater requirement of whole plant will reduce from 52744 KLD to 52371 KLD, respectively. Water will be available from the River Kalisindh. There will not be any additional drawl of fresh water from River Kalisindh.

6. After Amalgamation and Amendment, the total effluent generation from whole plant will reduce from 11352 KLD to 11305 KLD. Effluent will be treated in respective treatment facilities (ETP, RO- ZLD Plant) and treated effluent will be reused in the plant for process and gardening. Only during rainy season (when there is sufficient flow in river for dilution), the treated water of G-I & G-II plant from holding pond is discharged to the Kalisindh River. G-III plant is Zero Liquid Discharge plant. Effluent from G-III Plant is treated in RO-ZLD Plant, no change from earlier practice. No change in domestic effluent is proposed. Total domestic effluent from whole plant (1272 KLD) will be treated in three no. of STPs and reused in gardening.

7. The power requirement of the plant is being met by in-house Captive power plant (CPP) in G-I and G-III of capacity 37 MWH and 18 MWH, respectively. The power is being generated by Natural gas-based Gas turbines. The flue gas from turbine is being used for heat recovery in HRSG to generate steam for plant operations. Plant is also having additional source of power supply from state grid for backup. After Amalgamation & Amendment, the additional power and steam requirement for G-III will be sourced through G-III -CPP.

8. Existing units (G-I & G-II) have Natural gas based 2x 80 TPH and 1x 160 TPH steam boiler. No additional Boiler is proposed. 30 m and 35 m stack height for 80 TPH and 160 TPH boilers respectively, have been provided for controlling the emissions within the statutory limit.

9. Details of Process and utilities emissions generation and its management is mentioned below:

Particular	Stack Height (m)	Stack Dia (m)	Parameter	Standards
G-I				
Auxiliary Boiler-I (80 TPH)	30	2.0	NOx	50 ppm
Auxiliary Boiler-II (80 TPH)	30	2.0	NOx	50 ppm
HRSG-I (70 TPH)	30	3.0	NOx	50 ppm
HRSG-II (70 TPH)	30	3.0	NOx	50 ppm
Prilling Tower-I	104	26.0	PM	50 mg/Nm^3
			Ammonia	175 mg/Nm^3
Primary Reformer-Ammonia-I	40	3.0	NOx	400 mg/Nm^3
EDG Set (1.6 MW)	19	0.45	PM	75 mg/Nm^3
			NMHC	150 mg/Nm^3
			CO	150 mg/Nm^3
			NOx	1100 ppm
G-II				
Auxiliary Boiler No. III (160TPH)	35	2.5	NOx	50 ppm
Prilling Tower-II	118	26	PM	50 mg/Nm^3
			Ammonia	175 mg/Nm^3
Primary Reformer - Ammonia-II	55	4.1	NOx	400 mg/Nm^3
EDG Set (2.5 MW)	30	0.9	PM	75 mg/Nm^3
			NMHC	150 mg/Nm^3

			CO	150 mg/Nm^3
			NOx	1100 ppm
G-III				
HRSG CPP (100 TPH)	43.5	3.0	NOx	100 mg/Nm^3
Prilling Tower	141.5	28.0	PM	50 mg/Nm^3
			Ammonia	175 mg/Nm^3
Primary Reformer - Ammonia-III	53.8	4.1	NOx	400 mg/Nm^3
EDG Set (2.4 MW)	30	0.5	PM	75 mg/Nm^3
			NMHC	150 mg/Nm^3
			CO	150 mg/Nm^3
			NOx	710 ppm
Dedusting Unit- G-I (Scrubber Packing Plant)	37.00	1.000	PM	150 mg/Nm^3
Dedusting Unit - G-II (Scrubber Packing Plant)	35.73	0.400	PM	150 mg/Nm^3
Dedusting Unit - G-III (Scrubber Packing Plant)	37	1.1	PM	150 mg/Nm^3
Dedusting Unit Screen House (Scrubber Screen House)	27.80	0.650	PM	150 mg/Nm^3
Dedusting Unit-G-III Screen House (Scrubber Screen House)	34	0.8	PM	150 mg/Nm^3

10. Details of Solid Hazardous Waste Management:

S. No	Name of Waste	Total Quantity (G-I +G-II+G-III)	After Amalgamation and Amendment Total Quantity (G-I+G-II+G-III)	Impact after Amalgamation and Amendment	Disposal Method
1	Discarded Containers	1000 nos per year	1000 nos per year	No Change	TSDF Udaipur
2	Used/Spent Oil	107 MTPA	107 MTPA	No Change	Recycler
3	Spent Catalyst	660 MTPA	660 MTPA	No Change	Recycler
4	RO & ZLD sludge	17000 MTPA	17000 MTPA	No Change	TSDF site at Udaipur
5	Contaminated Cotton Rags/other cleaning materials	12.00 MTPA	12.00 MTPA	No Change	Common Incinerator

11. The project proponent has submitted that during rainy times the land gets saturated with water, hence the treated effluent cannot be used for irrigation even after 4-5 days after stoppage of rains. During these 4-5 days of post rain also, treated effluent has to be discharged in to the River. Considering all above facts, requested the Committee to consider following for CFCL:

> *"Industry is permitted to continue to discharge treated effluent water to the River Kalisindh as per existing conditions and whenever the rainfall is more than 5 mm in a day, then also industry is allowed to make consequential discharge for 5 days succeeding the rainy days, following the existing practice of intimation to SPCB."*

Further, they have submitted the last 5 years of the rainfall (precipitation) data at CFCL – Gadepan area. The total and daily average precipitation for the rainy months of June to September from year 2016 to 2020 are as below.

Year	2016	2017	2018	2019	2020
Total precipitation (June to Sept) - **mm**	933	351	1119	1586	544
Average daily precipitation June to Sept - **mm**	7.78	2.93	9.33	13.22	4.54

12. The proposal was considered by the **EAC (Industry 3 Sector) in its meetings held during 1-2nd February, 2021, 22 -23rd February, 2021, and 18-19th May, 2021.** The project proponent and their consultant M/s. EQMS India Pvt. Ltd., made a detailed presentation through Video Conferencing (VC) and have presented the addendum to EIA report.

The EAC, constituted under the provision of the EIA Notification, 2006 and comprising of Experts Members/domain experts in various fields, have examined the proposal submitted by the Project Proponent in desired form and submitted by the Consultant accredited by the QCI/ NABET on behalf of the Project Proponent.

The EAC noted that the Project Proponent has given undertaking that the data and information given in the application and enclosures are true to the best of his knowledge and belief and no information has been suppressed in the report. If any part of data/information submitted is found to be false/ misleading at any stage, the project will be rejected and Environmental Clearance given, if any, will be revoked at the risk and cost of the project proponent.

The EAC deliberated the proposal and made due diligence for amalgamation and amendment as stated above. The EAC after detailed deliberation recommended the proposal for amalgamation and amendment in the EC with all other conditions shall remain unchanged as stipulated in the previous ECs.

13. Based on recommendations of EAC and submission of the project proponent, the Committee, after detailed deliberation, has recommended the following amendments in the earlier environmental clearances:

(a) The details of the product and capacities are as under:-

S. No.	**Product**	**Unit**	**Existing as per EC & CTO**	**Total (Exist**	**Proposed/ Amendment**	**Total After Amalgamation**

			G-I with CPP	G-II	G-III	ing)	G-I with CPP	G-II	G-III	and Amendment
1	Ammonia	MTPD	2000	**1900**	**2200**	6100	2000	**1750**	**2350**	6100
2	Urea	MTPD	3500	**3300**	**4000**	10800	3500	**3100**	**4200**	10800
3	Captive Power Plant	MWH	37	0	18	55	37	0	18	55
4	Steam (HSRG)	TPH	140	0	100	240	140	0	100	240
5	Steam (Boiler)	TPH	160	160	0	320	160	160	0	320

(b) Para 5 A.(v) of the environmental clearance dated 21.05.2007 shall be read as under:-

"…….*The discharge from G-I and G-II plant in the Kalisindh River be permitted only during the rainy season when the precipitation value is more than 5 mm in a day, after meeting the stringent norms as prescribed. During non-monsoon season, when precipitation is less that 5 mm in day (threshold value), the discharge from G-I & G-II plant in the Kalisindh River is not permitted and shall be ZLD system. The Committee further desired that the concerned State Pollution Control Board from time to time shall monitor discharge from G-I & G-II plant in the Kalisindh River and ensure strict compliance of the same and report this non-compliance, if any, to this Ministry. The State Pollution Control Board shall also ensure that the River water quality remains un-deteriorated*".

14. All other terms and conditions stipulated in the earlier environmental clearances dated 24.07.1996, 21.05.2007, 18.09.2007, 22.04.2010, 10.06.2011 and 22.06.2015 shall remain unchanged.

15. This issues with approval of the competent authority.

18/06/2021

(Dr. R. B. Lal)
Scientist 'E'/Additional Director
Tele-fax: 011-24695362
Email-rb.lal@nic.in

(डा. आर. बी. लाल)
(Dr. R. B. LAL)
वैज्ञानिक 'ई'/Scientist 'E'
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
Min.of Environment,Forest and Climate Change
भारत सरकार, नई दिल्ली
Govt. of India, New Delhi

Copy to: -

1. The Secretary, Forests & Environment Department, Government of Rajasthan, Vaniki Path, Near Secretariat, Jaipur-302005

2. The Secretary, Irrigation Department, Government of Rajasthan, Vaniki Path, Near Secretariat, Jaipur-302005

3. The Deputy Director General of Forests (C), Integrated Regional Office Jaipur, A-209 & 218, Aranya Bhawan, Mahatma Gandhi Road, Jhalana Institutional Area, Jaipur, Rajasthan-304002

4. The Member Secretary, Central Pollution Control Board Parivesh Bhavan, CBD-cum-Office Complex, East Arjun Nagar, Delhi -32

5. The Member Secretary, Rajasthan State Pollution Control Board, 4, Jhalana Institutional Area, Jhalana Doongri, Jaipur, Rajasthan 302004-For necessary compliances, as stated above.

6. District Magistrate, Kota, Rajasthan

7. Guard File/Monitoring File/Parivesh portal/Record File

(Dr. R. B. Lal)
Scientist 'E'/Additional Director

ANNEXURE- 2: Latest CTO Letter

Head Office (PDF)
Rajasthan State Pollution Control Board
4, Institutional Area, Jhalana Doongari, Jaipur-302 004
Phone: 0141-5159856 Fax: 0141-5159697

Registered

File No : **F(Tech)/Kota(Digod)/6398(1)/2021-2022/5824-5826**
Order No : **2021-2022/PDF/4053**
Date: **Jan 21 2022 5:15PM**
Unit Id : 1107

M/s Chambal Fertilizers & Chemicals Ltd.

P.O Gadepan ,Kota-325208 , Tehsil:Digod
District:Kota

Sub: **Consent to Operate** under section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 and under section 21(4) of Air (Prevention & Control of Pollution) Act, 1981.

Ref: Your application for Consent to Operate dated 16/11/2021 and subsequent correspondence.

Sir,

Consent to Operate under the provisions of section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 (hereinafter to be referred as the Water Act) and under section 21 of the Air (Prevention & Control of Pollution) Act, 1981, (hereinafter to be referred as the Air Act) as amended to date and rules & the orders issued thereunder **is hereby granted** for your **Ammonia and Urea Fertilizer plant** situated at **Village Gadepan Tehsil:Digod District:Kota** , Rajasthan, subject to the following conditions:-

1 That this Consent to Operate is valid for a period from **22/01/2022** to **31/12/2026** .

2 That this Consent is granted for manufacturing / producing following products / by products or carrying out the following activities or operation/processes or providing following services with capacities given below.

Particular	Type	Quantity with Unit
Ammonia	Product	6,100.00 MTPD
POWER GENERATION FROM CAPTIVE POWER PLANT	Product	55.00 MWH
STEAM FROM HRSG (CPP)	Product	240.00 TPH
STEAM GENERATION FROM AUXILIARY BOILER	Product	320.00 TPH
UREA	Product	10,800.00 MTPD

3 That this consent to operate is for existing plant, process & capacity and separate consent to establish/operate is required to be taken for any addition / modification / alteration in process or change in capacity or change in fuel.

Signature valid
Digitally signed by Rakesh Kumar Thakuria
Date: 2022.01.21 18:07:03 IST
Reason: SelfAttested
Location:

4 That the quantity of effluent generation along with mode of disposal for the treated effluent shall be as under:

Type of effluent	**Max. effluent generation (KLD)**	**Recycled Qty of Effluent (KLD)**	**Disposed Qty of effluent (KLD)and mode of disposal**
Domestic Sewage	1272.000	NIL	1,272.000 To be treated in STP and to be utilized in plantation & other gainfull uses after disinfection
Trade Effluent	11452.000	3,172.000	8,280.000 To be utilized in plantation & other gainfull uses after proper adequate treatment in ETP

5 That the sources of air emmissions along with pollution control measures and the emission standards for the prescribed parameters shall be as under:

Sources of Air Emmissions	**Pollution Control Measures**	**Prescribed**	
		Parameter	**Standard**
Auxilliary Boiler- I,II and III(320TPH)	ADEQUATE STACK HEIGHT	NOx	50 PPM
Bagging Plant- I, II & III	ADEQUATE STACK HEIGHT , WET SCRUBBER	Particulate Matter	150 mg/Nm3
HRSG - I,II & III with CPP(240TPH)	ADEQUATE STACK HEIGHT	NOx	100 PPM

Signature valid
Digitally signed by Rajesh Kumar Thakuria
Date: 2022.01.21 16:07:03 IST
Reason: SelfAttested
Location:

Registered

File No : **F(Tech)/Kota(Digod)/6398(1)/2021-2022/5824-5826**
Order No : **2021-2022/PDF/4053**
Date: **Jan 21 2022 5:15PM**
Unit Id : 1107

One D.G. set(2.4MW)	ACOUSTIC ENCLOSURE , ADEQUATE STACK HEIGHT	NOx (as NO2) (at 15% O2) day basis in ppmv NMHC (as C) (at 15% O2) PM (at 15% O2) CO (at 15% O2)	710 100 mg/Nm3 75 mg/Nm3 150 mg/Nm3
PRILLING TOWETR- I,II & III	ADEQUATE STACK HEIGHT	Particulate Matter Ammonia	50 mg/NM3 total emission of 0.5 kg/ton of urea production 175 mg/NM3
Primary Reformer-I,II and III	ADEQUATE STACK HEIGHT	NOx	400 MG/NM3
Two D.G. sets (2.5 MW)(1.6MW)	ACOUSTIC ENCLOSURE , ADEQUATE STACK HEIGHT	NOx (as NO2) (at 15% O2) day basis in ppmv NMHC (as C) (at 15% O2) PM (at 15% O2) CO (at 15% O2)	1100 150 mg/Nm3 75 mg/Nm3 150 mg/Nm3

Signature valid
Digitally signed by Rajesh Kumar Thakuria
Date: 2022.01.21 18:07:03 IST
Reason: SelfAttested
Location:

6 That the **Ammonia and Urea Fertilizer plant** will comply with the standards as prescribed vide MOEF notification No. GSR 826(E) dated 16th November, 2009 with respect to National Ambient Air Quality Standards.

7 That the domestic sewage shall be treated before disposal so as to conform to the standards prescribed under the Environvent (Protection) Act-1986for disposal **On Land for irrigation**. The main parameters for regular monitoring shall be as under.

Parameters	**Standards**
Total Suspended Solids	**Not to exceed 100 mg/l**
pH Value	**Between 5.5 to 9.0**
Oil and Grease	**Not to exceed 10 mg/l**
Nitrate Nitrogen	**Not to exceed 10 mg/l**
Free Available Chlorine	**Not to exceed 0.5 mg/l**
BOD (3 days at 27C)	**Not to exceed 30 mg/l**

8 That the trade effluent shall be treated before disposal so as to conform to the standards prescribed under the Environment (Protection) Act-1986 for disposal **On Land for irrigation** . The main parameters for regular monitoring shall be as under

Signature valid
Digitally signed by Rajesh Kumar Thakuria
Date: 2022.01.21 18:07:03 IST
Reason: SelfAttested
Location:

Registered

File No : F(Tech)/Kota(Digod)/6398(1)/2021-2022/5824-5826
Order No : 2021-2022/PDF/4053
Date: Jan 21 2022 5:15PM
Unit Id : 1107

Parameters	Standards
Total Suspended Solids	Not to exceed 100 mg/l
Oil and Grease	Not to exceed 10 mg/l
Ammonical Nitrogen (as N)	Not to exceed 50 mg/l
Chemical Oxygen Demand	Not to exceed 250 mg/l
Arsenic (as As)	Not to exceed 0.2 mg/l
Hexavalent Chromium (as Cr+6)	Not to exceed 0.1 mg/l
Total Chromium (as Cr)	Not to exceed 2.0 mg/l
Cyanide (as CN)	Not to exceed 0.2 mg/l
Vanadium (as V)	Not to exceed 0.2 mg/l
Nitrate Nitrogen	Not to exceed 10 mg/l
Phosphate	Not to exceed 5 mg/l
pH Value	Between 6.5 to 8.5
BOD (3 days at 27C)	Not to exceed 30 mg/l
Copper (total)	Not to exceed 1.0 mg/l
Iron (total)	Not to exceed 1.0 mg/l
Zinc	Not to exceed 1.0 mg/l
Total Kjeldahl Nitrogen (as N)	Not to exceed 75 mg/l
Free Ammonical Nitrogen (as N)	Not to exceed 2.0 mg/l

9 That this Consent to Operate is valid for the production of Urea @ 10800.00 MTPD, Ammonia @ 6100.00 MTPD, Steam from HRSG (CPP) @ 240 TPH, Steam generation from auxiliary boiler @ 320 TPH & Power generation from captive power plant @ 55 MWH within existing plant premises.

Signature valid
Digitally signed by Ra[illegible]esh Kumar
Thakuria
Date: 2022.0[illegible].21 1[illegible]:07:03 IST
Reason: SelfAttested
Location:

10 That after issuance of this consent to operate, all the previous consent to operate granted vide order no. 2017-2018/PDF/123, 2017-2018/PDF/125, 2017-2018/PDF/124 dated 01.08.2017 & order no. 2018-2019/PDF/3830 dated 01.05.2018 shall not be valid.

11 That the total capital investment of project shall not exceed to Rs. 957,583.87 lacs. In case of any increase in total capital investment additional fee as per the fee notification dated 26.05.2016 shall be required to be deposited.

12 That industry shall not carry out any modification/change in process or manufacture/produce any other products/byproducts, which require environment clearance as per the provisions of Environment Impact Assessment Notification dated 14/09/2006, notified by Ministry of Environment & Forests, Government of India, without prior permission from the State Board.

13 That the industry shall comply with the conditions of Environment Clearance accorded by Ministry of Environment, Forest & Climate Change, Govt. of India, vide letter dated 15.11.1988, dated 24.07.1996, dated 21.05.2007, dated 18.09.2007, dated 22.04.2010, dated 10.06.2011, dated 22.06.2015 and dated 18/06/2021 amended by letter dated 16/11/2021.

14 That the total water requirement of the plant shall not exceed 55916 KLD (47592 KLD - Cooling Tower + 4700 KLD - Boiler + 192 KLD- Service water + 3400 KLD - domestic use + 32 KLD - Fire hydrant), out of which 52744 KLD shall be met from freshwater (surface water) and 3172 KLD shall be met by recycling of the process effluent of 3072 KLD from Phase-III through reverse Osmosis System and 100 KLD from the Boiler Blowdown.

15 That total freshwater requirement shall not exceed 52744 KLD (44420 KLD - Cooling Tower + 4700 KLD - Boiler + 192 KLD- Service water + 3400 KLD - domestic use + 32 KLD - Fire water) and the same shall be met from river KaliSindh.

16 That the freshwater requirement for the project shall be met through River KaliSindh as per agreement between State of Rajasthan and M/s Chambal Fertilizers and Chemicals Limited made on 08/12/2009, and addendum agreement made on 21/03/2017. The industry shall comply with the conditions of both the agreements made under and the total intake of the water from river Kali Sindh for the entire industry shall not exceed the quantity permitted by the State Government.

17 That neither any ground water will be abstracted nor any ground water abstraction structure shall be constructed without obtaining prior permission from the Central Ground Water Authority (CGWA).

18 That the water consumption and the wastewater generation shall not exceed to 8m^3/MT and 3m^3/MT respectively of Urea produced.

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19 That the industry shall further explore the possibilities of reduction in total water requirement and increase in recycle of treated effluent (trade/domestic) in process.

20 That the quantity of trade effluent generated from the plant shall not exceed 11452 KLD and shall be treated through Effluent Treatment Plant (ETP) of adequate capacity up to the prescribed norms mentioned at condition number 7. Out of 11452 KLD treated trade effluent, 3172 KLD shall be recycled/reused and remaining 8280 KLD shall be used in green belt after adequate treatment (Other than ammonia urea process effluent)or discharged into River KaliSindh during rainy season from phase I & II plant only.

21 That discharge from phase I & II plant in the Kalisindh River is permitted only during the rainy season when the precipitation value is more than 5 mm in a day and its succeeding 10 days (max.) depending on the rainfall, after meeting the stringent norms as prescribed in amended EC dated 16/11/2021. During non-monsoon discharge from phase I & II plant in the Kalisindh River is not permitted and shall be ZLD system for river discharge.

22 That the treated effluent of Phase-III Plant through Reverse Osmosis system shall be either reused in process or recycled within the premises of the industry only. That the Phase-III unit of the industry shall maintain Zero Liquid Discharge status.

23 That the domestic effluent (1272 KLD) shall be treated through Sewage Treatment Plants (03 in nos.) of adequate capacity up to the norms mentioned at condition no. 7 and shall be used for plantation/horticulture within the premises.

24 That the industry shall not dispose of any effluent (treated/untreated or domestic/trade) in form of a cesspool within/outside the premises.

25 That pipelines for conveyance of raw trade effluent and disposal points for treated effluent within the premises shall be kept above ground level and shall be made of appropriate rigid material. That no flexible pipeline shall be used for carrying of the same.

26 That the industry shall make arrangements for proper channelizing of stormwater through stormwater drains and process waste shall not be allowed to get mixed with stormwater.

27 That industry shall maintain water meters for measuring & recording the amount of freshwater intake, water consumed in various processes, effluent generated, effluent treated, effluent recycled & effluent disposed of. The daily record of the meters readings shall be maintained in a separate logbook and a monthly summary shall be submitted to Regional Office, Kota

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28 That industry shall comply with the directions given by District Court Baran vide order dated 29/09/2010 i.e "Industry shall ensure to inform the farmers through notice Board & through Regional Office, RSPCB, Kota along with SDM&PHED, Baran in writing before the discharge of any treated effluent into the river Kalisindh". The discharge shall be made only through a closed conduit pipeline and during the rainy seasons only. The industry shall also submit to the Regional Office, Kota, and the river flow data of the preceding and succeeding weeks.

29 That industry shall maintain a sample collection point with the closed conduit pipeline provided for carrying the treated effluent into river Kalisindh, during the rainy season, in consultation with Regional Officer, RSPCB, Kota so as to verify the compliance of standards as prescribed herein.

30 That the industry shall maintain separate energy meters at pollution control measures & effluent treatment plant. The daily record of the energy meter readings shall be maintained in a separate logbook and a monthly summary shall be submitted to Regional Office, Kota.

31 That the industry shall not use pet coke/furnace oil in any process/service/utility in compliance to the order dated 17/11/2017 of Hon'ble Supreme Court, wherein a ban has been imposed on the use of pet coke and furnace oil in the State of Rajasthan.

32 That the industry shall maintain the adequate and safe height of stack(s) attached with Primary Reformer, Heat Recovery Steam Generator Stack (CPP), Auxiliary Boiler, Prilling Tower and D.G Sets and the requisite air pollution control measures shall be kept operational all the time.

33 That the industry shall maintain the necessary and safe infrastructural facilities for the monitoring of stack emissions with all sources of air pollution requiring monitoring in accordance with the Environment (Protection) Act, 1986 and/or suggestions/directions given time to time by the State Board.

34 That the industry shall comply with the standards for treated effluent and air emission prescribed for the Fertilizer industry (Nitrogenous) and for Gas/Naphtha Based Thermal Power Plant under Environment (Protection) Rules, 1986.

35 That the industry shall maintain the continuous emission and effluent online monitoring system for monitoring of pollutants along with PTZ IP cameras as per CPCB guidelines to ensure Zero Liquid Discharge and ensure connectivity with the server of the State Board and Central Pollution Control Board.

36 That the industry shall maintain a system for proper channelization and control arrangement for the fugitive emissions from the process, material handling/other activities so as to comply with the National Ambient Air Quality Standards.

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37 That industry shall ensure the operation of ambient air quality stations at the periphery of the factory premises for the monitoring of applicable pollutants listed under National Ambient Air Quality Standards, 2009. The number and location of these monitoring stations along with applicable pollutants and frequency of monitoring shall be decided in consultation with Regional Officer, RSPCB, Kota.

38 That the industry shall comply with provisions of the Manufacture, Storage & Import of Hazardous Chemical Rules, 1989 and Hazardous & other Wastes (Management & Transboundary Movement) Rules, 2016 and Public Liability Insurance Act, 1991.

39 That the power supply to the production shall be so interlocked with the pollution control equipment's that in the event of non-functioning of the pollution control equipment, the production process stops automatically.

40 That the industry shall ensure compliance of recommendation of Corporate Responsibility for Environment Protection (CREP) issued by Central Pollution Control Board, New Delhi.

41 That industry shall submit quarterly analysis/monitoring report of source emission/ambient air/waste water/noise from the State Board laboratory or any laboratory approved/ recognized by Ministry of Environment, Forest & Climate Change, Government of India.

42 That industry shall provide wall-to-wall carpeting in vehicle movement areas within premises to avoid re-entrainment of road dust.

43 That industry shall undertake regular cleaning and wetting of roads for control of fugitive dust emissions.

44 That the industry shall maintain good housekeeping all the time.

45 That industry shall not install any other sources of Air pollution/Water pollution without obtaining prior Consent to Establish from the State Board.

46 That industry shall maintain adequately designed rain water harvesting structure for preservation of ground water level of the area.

47 Minimum 33 % of the area for the industry should be covered by plantation and plantation shall be carried out to develop a green belt along the periphery.

48 That any incorrect information submitted in the consent application form or the declaration shall make the industry liable for legal action under section 42 of the Water Act and under section 38 of the Air Act.

49 That emission/effluents found to be discharged in excess of the standards prescribed shall be punishable under section 43 of the Water Act and under section 37 of the Air Act.

50 That industry shall submit quarterly compliance reports of consent conditions to this office as well as Regional Office, Kota.

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51 That, not withstanding anything provided hereinabove, the State Board shall have power and reserves its right, as contained **under section 27(2) of the Water Act and under section 21(6) of the Air Act** to review anyone or all the conditions imposed here in above and to make such variation as it deemed fit for the purpose of **Air Act & Water Act**.

52 That the grant of this **Consent to Operate** is issued from the environmental angle only, and does not absolve the project proponent from the other statutory obligations prescribed under any other law or any other instrument in force. The sole and complete responsibility to comply with the conditions laid down in all other laws for the time-being in force, rests with the industry/ unit/ project proponent.

53 That the grant of this **Consent to Operate** shall not, in any way, adversely affect or jeopardize the legal proceeding, if any, instituted in the past or that could be instituted againt you by the State Board for violation of the provisions of the Act or the Rules made thereunder.

54 That the Project Proponent shall comply with provisions of the E-waste (Management) Rules, 2016 and ensure that e-waste generated by them is channelized through collection centre or dealer of authorized producer or dismantler or recycler or through designated take back service provider of the producer to authorized dismantler or recycler.

55 That the Project Proponent shall maintain record of e-waste generated by them in Form-2 and make such records available for scrutiny by the board.

56 That the Project Proponent shall file annual returns in Form-3, to the Board on or before the 30th day of June following the financial year to which that return relates

57 That the transportation of e-waste shall be carried out as per the manifest system whereby the transporter shall be required to carry a document (three copies) prepared by the sender, giving the details as per Form-6.

58 That the Project Proponent shall comply with provisions of the Batteries (Management and Handling) Rules, 2001 (as amended) and submit half yearly returns (as bulk consumer, importer, auctioneer, recycler as the case may be) to the State Board as provided under Rule 10 (2) (ii) of the Battery (Management and Handling) Rules, 2001 (as amended). In Case the Project Proponent is not a bulk consumer even then the used batteries shall be returned to the authorized dealers or recyclers only.

59 That the record of batteries purchased and sold/ returned to registered dealers and/ or authorized recyclers shall be maintained and made available to the officers of the Board during inspections.

This **Consent to Operate** shall also be subject, besides the aforesaid specific conditions, to

Signature valid

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Thakuria
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Location:

Registered

File No : **F(Tech)/Kota(Digod)/6398(1)/2021-2022/5824-5826**
Order No : **2021-2022/PDF/4053**
Date: **Jan 21 2022 5:15PM**
Unit Id : 1107

the general conditions given in the enclosed Annexure. The project proponent will comply with the provisions of the **Water Act and Air Act** and to such other conditions as may, from time to time , be specified, by the State Board under the provisions of the aforesaid Act(s). Please note that, non compliance of any of the above stated conditions would tantamount to revocation of **Consent to Operate** and project proponent / occupier shall be liable for legal action under the relevant provisions of the said Act(s).

This bears the approval of the competent authority.

Yours Sincerely

Group Incharge[PDF]

(A): **Copy To:-**

1 Regional Officer, Regional Office, Rajasthan State Pollution Control Board, Kota to ensure compliance of consent conditions and monitor discharge of phase-I and II plant in the Kalisindh River time to time and ensure strict compliance of same and report non-compliance if any.

2 Master File.

Group Incharge[PDF]

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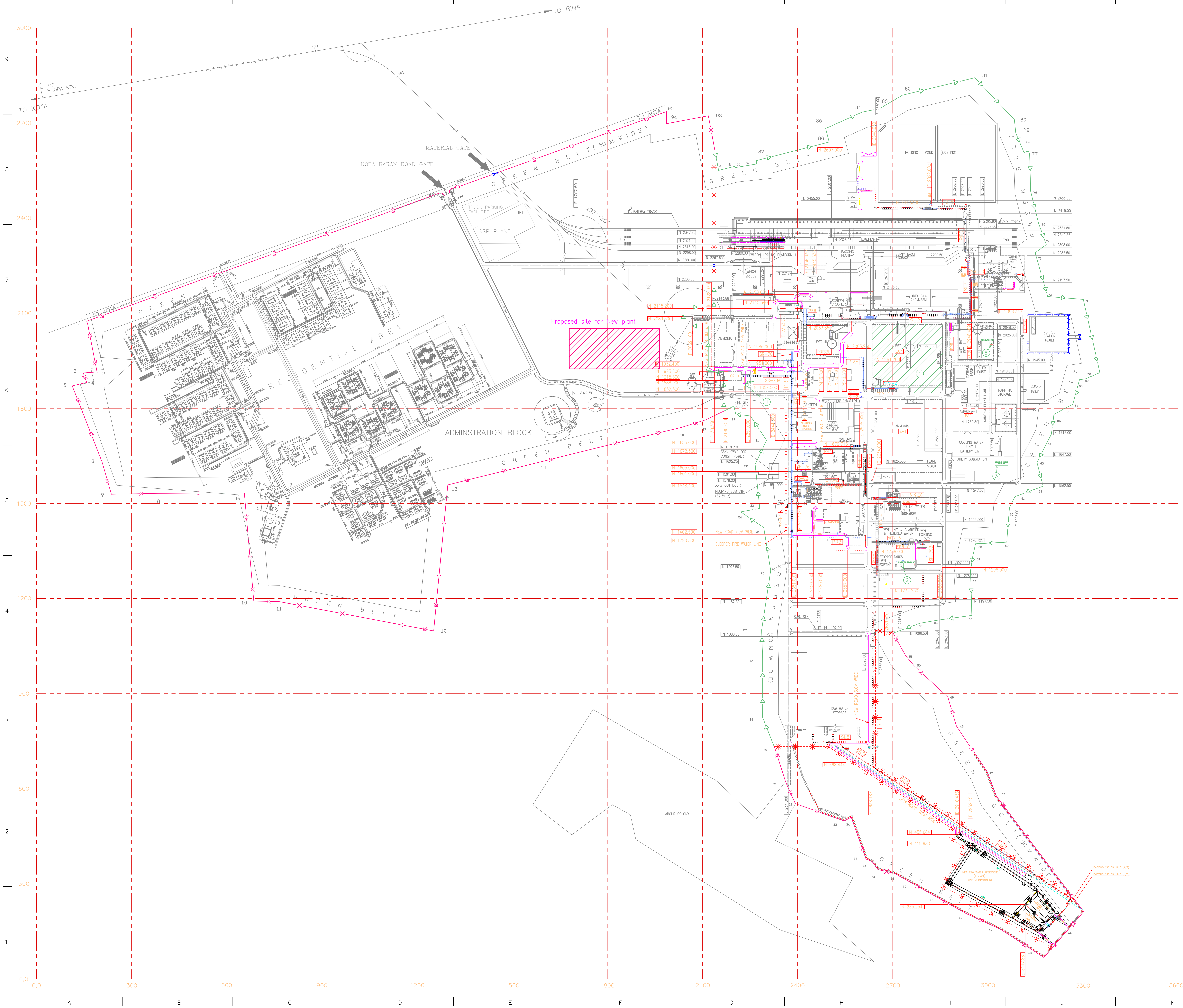
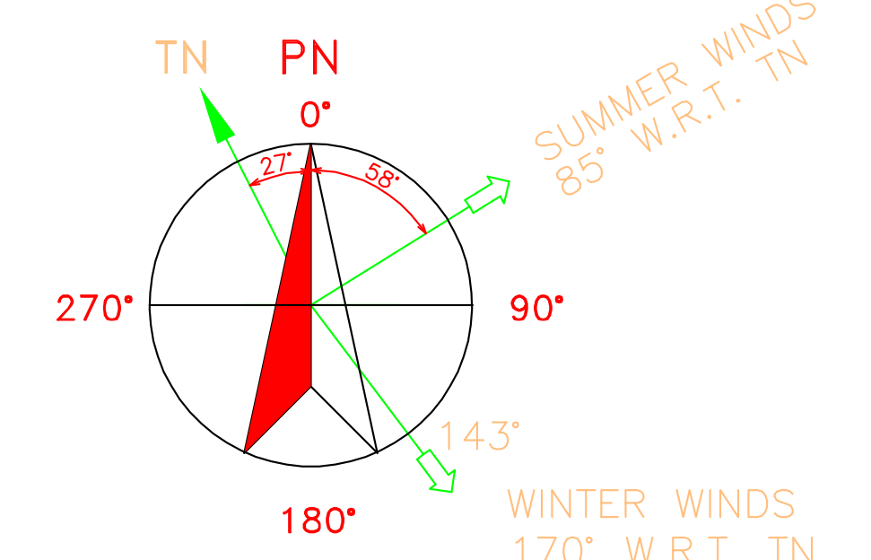
ANNEXURE- 3: Layout Plan

DWG NO. E-6340-PIP-010





GENERAL NOTES

1. ALL DIMENSIONS ARE IN MILLIMETER AND CO-ORDINATES ARE IN METER.
2. PLANT DATUM EL. 0.000M CORRESPONDS TO +247.50M ABOVE MEAN SEA LEVEL.
3. OPERATION OF NG REC STATION (GAIL) IS NOT IN CFCL SCOPE. IT IS OPERATED BY GAIL.

NEW ADDITIONS AFTER 2018

SL.NO.	DESCRIPTION	GRID	REMARK
1.	CHLORINATION BUILDING IN AMM-3	6-G	
2.	CHLORINATION BUILDING IN WPT	6-G	
3.	NEW STORE BUILDING	5-J	
4.	NEW ADDITIONS IN UREA-1	7-I	
A.	21-E-5B (NEW CARBAMATE CONDENSER)		
B.	21-E-16 (NEW CARBAMATE PREHEATER)		
C.	11/21 MV60 (NEW STEAM SATURATORS)		
D.	11-C-7 (PCT VENT SCRUBBER IN COMMON SEC)		
E.	11-E-18N (PREHEATER FOR DISTILLATION TOWER)		
F.	NEW VAM UNIT IN COMMON SECTION		
G.	11-E-61 (NEW CO2 COOLER)		
5.	U-FA-305 (NEW UREA SOLUTION TANK)	6-J	

LEGEND:-

───	NEW ADDITIONS AND MODIFICATION
─▷─▷─	PLANT BOUNDARY WALL
---✳---✳---	PLANT BOUNDARY FENCING
─⊗─⊗─	BOUNDARY NON PLANT/ RESIDENTIAL AREA
-○-○-○-	GAIL'S PREMISES FENCE (NOT IN CFCL CONTROL)

AS BUILT

REV.	DATE	PURPOSE	PREP	CHKD	APVD	AUTHD
6	29-06-2021	NEW ADDITIONS	SS	SS	DG	–
5	25-10-2018	OVERALL PLANT LAYOUT INCLUDING CFG3 UNITS	ATUL	DCG	SKS	URS
4	14-08-2018	AS-BUILT	YC	SA	DM	–
3	24/03/2017	AFC	CD	VG/SA	JG	–
2	18/11/2016	AFD	CD	VG/SA	JG	–
1	16/06/2016	AFP-1	CD	VG/SA	JG	–
0	12/02/2016	AFP	CD	VG/SA	JG	–

OFFSITE AND UTILITIES FOR CFG3 PLANTS(G3OU)

CFCL
CHAMBAL FERTILISERS AND
CHEMICALS LTD.
GADEPAN, KOTA

SECURITY LEVEL: 2

TOYO ENGINEERING

TOYO WORK NO. 6340
CLIENT'S WORK NO.

OVERALL PLOT PLAN

Equipment No.	System No.	FWBS	AWBS
–	–	–	–

SCALE		CLASS	AREA	DIS	TYP	SUB-TYP	SEQ	SHEET	REV.
	TOYO DWG. No.	–	–	–	–	–	–	–	
1/4000	PROJECT DWG. No.	E-6340-PIP-010							6
@A0	FILE NAME	E-6340-PIP-010.DWG							

ANNEXURE- 4: Proposed TOR

5(a): STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR CHEMICAL FERTILIZERS AND INFORMATION TO BE INCLUDED IN EIA/EMP REPORT

A. STANDARD TERMS OF REFERENCE

1) Executive Summary

2) Introduction

- i. Details of the EIA Consultant including NABET accreditation
- ii. Information about the project proponent
- iii. Importance and benefits of the project

3) Project Description

- i. Cost of project and time of completion.
- ii. Products with capacities for the proposed project.
- iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.
- iv. List of raw materials required and their source along with mode of transportation.
- v. Other chemicals and materials required with quantities and storage capacities
- vi. Details of Emission, effluents, hazardous waste generation and their management.
- vii. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)
- viii. Process description along with major equipments and machineries, process flow sheet (quantative) from raw material to products to be provided
- ix. Hazard identification and details of proposed safety systems.
- x. Expansion/modernization proposals:
    - a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing Iexisting operation of the project from SPCB shall be attached with the EIA-EMP report.
    - b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification

2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.

4) Site Details

i. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.

ii. A toposheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)

iii. Details w.r.t. option analysis for selection of site

iv. Co-ordinates (lat-long) of all four corners of the site.

v. Google map-Earth downloaded of the project site.

vi. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.

vii. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.

viii. Landuse break-up of total land of the project site (identified and acquired), government/ private - agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (not required for industrial area)

ix. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area

x. Geological features and Geo-hydrological status of the study area shall be included.

xi. Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)

xii. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.

xiii. R&R details in respect of land in line with state Government policy.

5) Forest and wildlife related issues (if applicable):

i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)

ii. Landuse map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha)

iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.

iv. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon.

v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area.

vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife.

6) Environmental Status

i. Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.

ii. AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.

iii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with - min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.

iv. Surface water quality of nearby River (100m upstream and downstream of discharge point) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.

v. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.

vi. Ground water monitoring at minimum at 8 locations shall be included.

vii. Noise levels monitoring at 8 locations within the study area.

viii. Soil Characteristic as per CPCB guidelines.

ix. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.

x. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.

xi. Socio-economic status of the study area.

7) Impact and Environment Management Plan

i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.

ii. Water Quality modelling - in case of discharge in water body

iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.

iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.

v. Details of stack emission and action plan for control of emissions to meet standards.

vi. Measures for fugitive emission control

vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.

viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.

ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.

x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.

xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.

xii. Action plan for post-project environmental monitoring shall be submitted.

xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.

8) Occupational health

i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers

ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.

iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved,

iv. Annual report of heath status of workers with special reference to Occupational Health and Safety.

9) Corporate Environment Policy

i. Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.

ii. Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.

iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.

iv. Does the company have system of reporting of non compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report.

10) Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.

11) Enterprise Social Commitment (ESC)

i. Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be included. Socio-economic development activities need to be elaborated upon.

12) Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.

13) A tabular chart with index for point wise compliance of above TOR.

B. SPECIFIC TERMS OF REFERENCE FOR EIA STUDIES FOR CHEMICAL FERTILIZER

1. Details on requirement of energy and water alongwith its source and authorization from the concerned department.
2. Energy conservation in ammonia synthesis for urea production and comparison with best technology.
3. Details of ammonia storage and risk assessment thereof.
4. Measures for control of urea dust emissions from prilling tower.
5. Measures for reduction of fresh water requirement.
6. Details of proposed source-specific pollution control schemes and equipments to meet the national standards for fertilizer.
7. Details of fluorine recovery system in case of phosphoric acid plants and SSP to recover fluorine as hydrofluorosilicicacid (H_2SiF_6) and its uses.
8. Management plan for solid/hazardous waste including storage, utilization and disposal of bye products viz., chalk, spent catalyst, hydro fluoro silicic acid and phosphor gypsum, sulphur muck,etc.
9. Details on existing ambient air quality for PM10, PM2.5, Urea dust*, NH3*, SO2*, NOx*,HF*,F*,Hydrocarbon (Methane and Non-Methane) etc., and expected, stack and fugitive emissions and evaluation of the adequacy of the proposed pollution control devices to meet standards for point sources and to meet AAQ standards.(*as applicable)
10. Details on water quality parameters in and around study area such as pH, Total Kjeldhal Nitrogen, Free Ammonical Nitrogen, free ammonia, Cyanide, Vanadium, Arsenic, Suspended Solids, Oil and Grease, *Cr as Cr+6, *Total Chromium, Fluoride, etc.

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