ENVIRONMENT MANAGEMENT AND ADVANCED WASTE TREATMENT SYSTEM IN NITROGENIOUS…

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ENVIRONMENT MANAGEMENT AND ADVANCED WASTE TREATMENT SYSTEM IN NITROGENIOUS FERTILIZERS PLANT

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ABSTRACT: The paper intended to the standpoint of harmful emissions typical nitrogen-based fertilizer plants producing ammonia and urea plants using the advanced available technologies. The critical emission points are established and analyzed. Several possible actions have been taken in order to minimize the emissions are presented.
KEYWORDS: Ammonia, Urea, Fertilizers, Environmental impact, pollution abatement, wastewater treatment.DM plant, Bagging Plants.

INTRODUCTION

Fertilizer industry can be divided into three main categories depending upon

1. Fertilizer raw materials
2. Fertilizer intermediates
3. Fertilizer products

Fertilizer Intermediates:

1. Sulphuric acid
2. Sodium Hydroxide
3. Chlorine gas
4. Vanadium Penta oxide (V_2O_5)
5. Oil, Grease & CTC/TEC, etc

Solid pollutants

1. Urea dust.
2. Urea
3. Catalyst
4. Catalyst dust
5. Sludge lagoon
6. Resin

LIQUID POLLUTANTS
Ammonical waste, urea waste, acid produced in DM plant, alkali produced in regeneration of resin. Sewage generated in factory and township.
GAS POLLUTANTS
Ammonia, Nox, SOx, Urea dust (spm) and CO_2, Chlorine,

National Fertilizers Limited, is a Government of India Undertaking, formed in the year 1974, NFL has four Units located at Nangal and Bathinda (Punjab), Panipat (Haryana) and Vijaipur (Madhya Pradesh) with its Corporate Office at Noida. The Company is one of the largest producers of nitrogenous fertilizers in the country. Besides, production and productivity the company lays utmost importance to social development and environment around its Units. On environment and pollution front, the company has taken all preventive measures so as to contain the emission levels within the standards prescribed by the State Govt. and Minimal Standards (MINAS).
Environment policy of NFL has been formulated for conservation and up gradation of environment. NFL is committed to achieve pollution free environment and balanced ecology by adopting Environment Management System (EMS) through:-

- Environmental Management System (EMS) as corporate policy with continued efforts for improvement.
- Training and motivation of employees including contractors (If any working at site) for awareness on environment and ecology.
- Assessing Environmental aspects before starting a new project or scheme and before decommissioning any installed facility.
- Advising and educating customers in the safe use, transportation, Storage and disposal of projects sold by the company.
- Operation of manufacturing plants and utilities in efficient manner to minimize the waste generation and consequent adverse environmental impact.
- Improvement and development in process technology.
- Development and maintenance of emergency management plans.
- Conducting regular environmental audits and compliance with the statutory and regular requirements.

The environment management philosophy at all the Units of NFL is based on the following key elements:-

(i) Recovery and reuse of process condensate within each plant with or without treatment.
(ii) Use of treated waste water for horticulture as well as development of Van Vihar(A garden)
(iii) Compliance of all the statutory requirements.
(iv) Continued improvements to meet the ever changing statutory requirements by incorporating the latest technologies in the process.

VIJAIPUR UNIT (AN ISO-9002 & ISO-14001 UNIT)
The Vijaipur Unit of NFL, is the first gas based plant on HBJ (Hazira-Bijapur-Jagadishpur) gas pipeline. Commercial production of Line-I group of plants was declared in July 1988 and that of Line-II in March 1997. Line-1 consist one stream of Ammonia of 1750 MTPD and line-2 capacity is 1864 MTPD. Capacity and line-1 stream of Urea of 3030 MTPD capacity and line-2 capacity 3231 MTPD. Thus the overall urea capacity is 6261 MTPD, but the plants are producing more than 6500 MTPD.

Both the Ammonia Plants are based on the steam reforming of natural gas and naphtha with technology supplied by Haldor Topsoe A/S Denmark. Whereas feedstock for Line-I Plant is natural gas, the Line-II plants have been designed to process natural gas and naphtha to a maximum limit of 50% as feedstock. Urea plants are based on the well-known total recycle ammonia stripping process of M/s. Saipem, Italy.

In the design itself necessary systems were provided to have negligible impact on environment. An effluent treatment Plant has been designed to cater the treatment needs of effluent generated from various sections of the Unit. In addition, adequate provisions have been made in each Plant to ensure maximum recycle of process condensate with minimum generation of effluent. A separate effluent monitoring cell has been set up to keep round the clock vigilance on effluent quality to ensure that the discharges are much lower than that specified by State Pollution Control Board.

IN BUILT POLLUTION CONTROL FACILITIES INCORPORATED IN ORIGINAL DESIGN IN UREA, AMMONIA AND DM PLANTS.

The main plants i.e. Ammonia and Urea are designed for complete recycle of process and steam condensate to reduce the load of effluent. The important effluent treatment facilities are summarized below:-

Urea & Bagging Plants

Provision of separate high pressure Urea Hydrolyser section for treatment of 80 M^3/hr. process water generated during Urea production process. Finally treated water is of such a good quality that it is used as boiler feed water. As shown in the figure-1. The main source of process water is the urea synthesis reaction:

$$\mathbf{2NH_3 + CO_2 \rightarrow CO\ (NH_2)_2 + H_2O}$$

Where 300 kg of water are formed per ton of urea. A urea plant of 450,000 t/yr generates theoretically about 410 m3 water/day (~17 m3 /hr). This water contains 6% NH_3, 4% CO_2 and 1% urea (by weight). In the analyzed plant, three main wastewater sources were evidenced: a) oily wastewaters from pumps and compressors seals, floor waters; b) wastewaters from ammonia recovery;

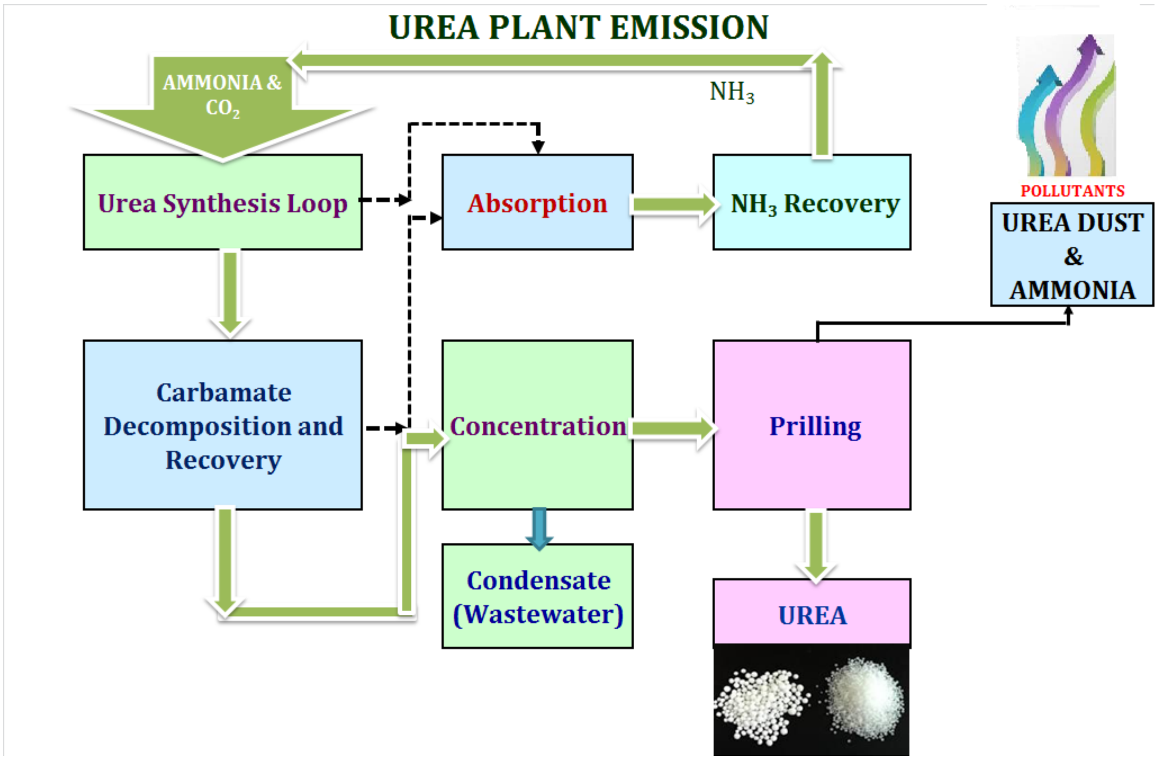
The air emissions consist mainly in ammonia, and they are located in three points:

a) The exhausters of the urea Prilling tower;

b) Gas exhaust from the ammonia absorber;

c) Gas exhaust from the final stack of the synthesis loop

All emissions are below the designed value, but they are lower than the maximal allowed concentration, 50 mg/ Nm3 , established by legal regulations The urea dust emitted from the exhausters of the Prilling tower has been drastically reduced by proper installed additional vacuum system i.e. Preconcentrator in both the line-I & line-II plants.



The floor washing containing up to 1000 ppm ammonia is collected in 100 cubic meter capacity underground floor washing pit, from where it is pumped to Effluent Treatment Plant for further treatment. Wash water from pumps, pipelines, drains etc. containing ammonia and carbamate solution are collected in a separate 10 cubic meter capacity stainless steel tank. The water is treated in urea hydrolyser section within Plant itself. Oily water from Pump house and compressor house is collected in 25 M^3 capacity underground concrete slop tank. Oil is skimmed with the help of Disc Oil Separator and Ammonical water is pumped to floor washing pit. Dust from conveyor galleries and bagging plant is dissolved in urea dissolving tank of 10 cubic meter capacity. The urea solution is re-prilled in the plant itself. The natural draft Prilling tower with rotating bucket is designed for urea dust concentration below 40 mg per cubic meter. The condensed vapors from the1st &2nd vacuum systems containing NH_3,Urea , CO_2 and water are collected in the process condensate tank In this tank, the solution of close drain (CD) collected tank (V-7) are also fed by means of pump P-12 A/B. From V-9 it is pumped to waste water tank V-6. From this tank it is pumped by P-16A/B to the distillation tower C-2. Before entering the distillation tower the process condensate is pre-heated in the exchanger E-18 A/B where the heating medium is purified condensate flowing out distillation tower bottom. Since the solution is contaminated by urea, after a first stripping in the upper part of the distillation tower it is umpped by P-14A/B into the hydrolyser R-2 where the urea is decomposed by means of super heated steam (HS) at 38 Ata and 381°C. The process flow digram is shown in the figure No.1.

Before entering the hydrolyser, the solution is pre-heated in the exchangers E-19 A/B/C with the solution coming from the hydrolyser. The vapors leaving the hydrolyser jointly with the vapors coming from the distillation tower Overhead condenser E-17 wherefrom the carbonate solution lows to the reflux accumulator V-8.

The purified waste water from the bottom of distillation tower is cooled in E-18 A/B and purified wastewater cooler E-20 A/B before going out the urea plant B/L .During start-up and transitory, the waste water is recycled to V-6 until it reaches the composition specified.

DESIGN DISCUSSION

As already pointed out in the process description, the liquefied effluent treatment section consists mainly of a stripping column to purify the waste water and a hydrolyser to decompose the small percentage of urea into NH_3 and CO_2 , which are eventually stripped in the lower section of the same distillation tower column. The vapors leaving the distillation tower column top are mixed with those coming from the hydrolyser are condensed in overhead condenser E-17. The heat is removed by cooling water.

The hydrolysis reaction of urea is the opposite of that occurring in the reactor, Viz.

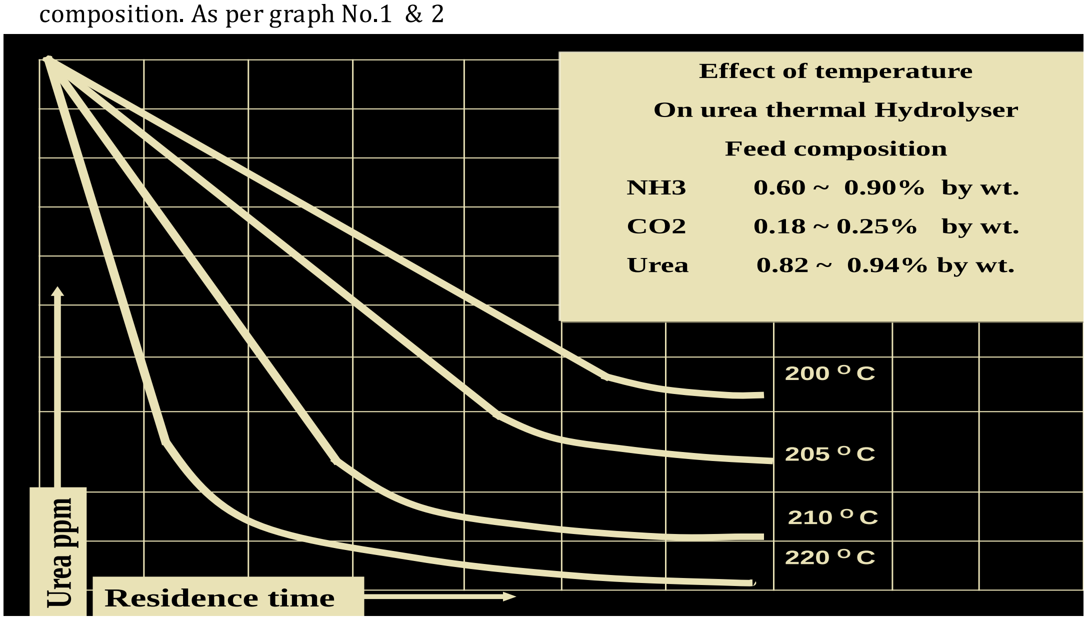
$NH_2.CO.NH_2 + H_2O \quad 2NH_3 + CO_2 - \Delta$

Therefore urea decomposition is favored by;

- High temperature,
- Low pressure,
- NH_3 and CO_2 deficiency and
- Also sufficiently long residence time has proved to be an important character.

In order to remove NH_3 and CO_2 as far as possible before feeding hydrolyser, the waste water coming from the vacuum condensers is first stripped in the column.

Moreover a series of baffles in the hydrolyser provide a plug flow effect, thus avoiding back mixing. Also the continuous removal of the hydrolysis reaction products is provided and this encourages the decomposition of urea. By eliminating NH_3 and CO_2 to the maximum extent, it is possible to maintain the pressure in the system at a relatively low value, while attaining rather high temperatures. For this proposal a 220°C temperature has been envisaged together with a 45 minute residence time. However we are maintaining ~234°C in UREA-II to attain required composition. As per graph No.1 & 2



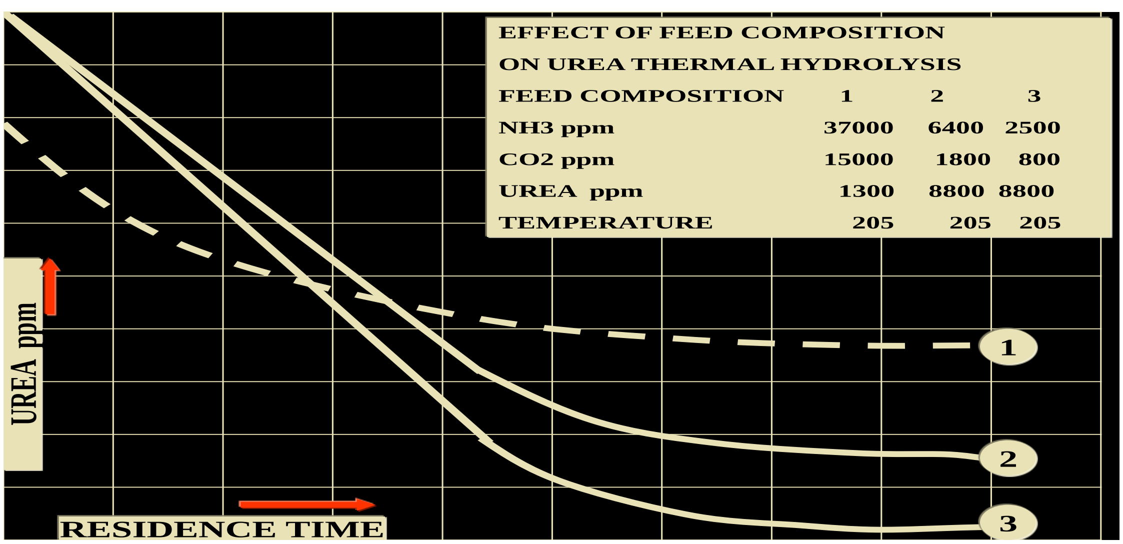
Graph No. 1

1. As the temperature of hydrolysis increases residence time required for the same amount of decomposition of urea decrease.

2. For same residence time the decomposition of urea increase with temperature.
3. As the concentration of NH_3 and CO_2 in the feed increases decomposition of urea decreases for the same residence time.
4. Residence time increases with increase in ammonia and CO_2 concentration for the same amount of urea decomposition.
5. In order to eliminate NH_3 & CO_2 as far as possible before feeding the hydrolyser, the waste water is first stripped in the distillation column.
6. continuous removal of hydrolysis products (NH_3 & CO_2)
    - increases decomposition of urea
    - Maintains low pressure
7. Series of baffles are provided in the hydrolyser to
    - Increase residence time
    - To provide plug flow effect and avoiding back mixing

Sources of waste water

FROM PROCESS	**43**	**M^3/Hr.**
LT's impulse line	**0.8**	**M^3/Hr.**
P-1 PLUNGERS (Amm Feed Pump)	**2.5**	**M^3/Hr.**
P-2 SEALS (HP Carb Pump)	**3.5**	**M^3/Hr.**
FROM V-8 (WW Section)	**21**	**M^3/Hr.**
LS TO VACUUM EJECTORS	**15**	**M^3/Hr.**
TOTAL	**85.8**	**M^3/Hr.**



Graph No.2

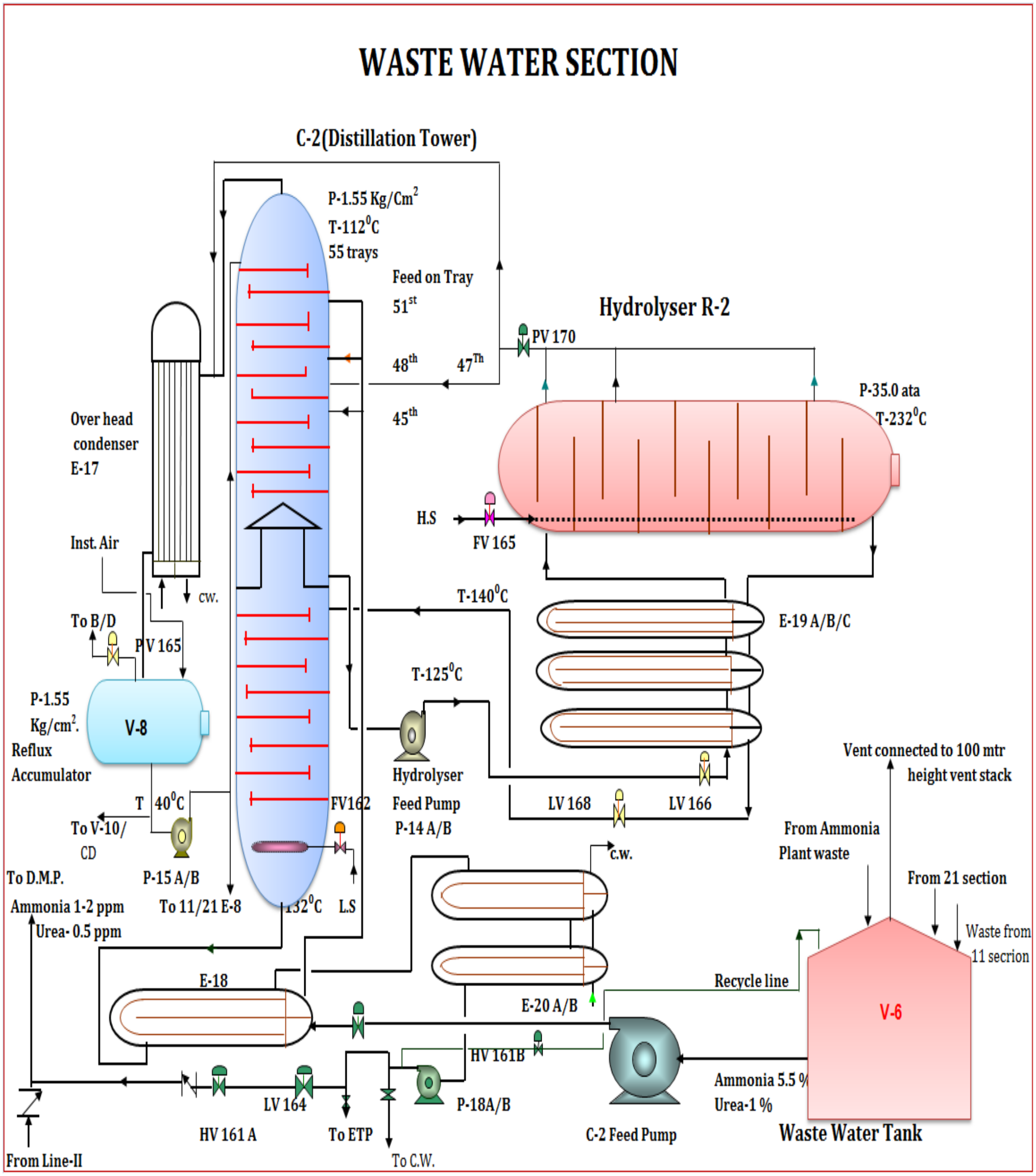


Fig. No. 1

Vents from all the process vessels and safety valves are connected to separators from where liquid effluent is sent back of Urea Hydrolyser section for further treatment and gases are vented to atmosphere from 100 M high vent. The ammonia concentration at working place is less than 20 ppm. Wet type dust extraction system has been installed in Urea conveying and Bagging System with cyclone separator & wet scrubber with DM water The dust from product flowing on conveyor belts and chutes is sucked with the help of fans and dissolved in water. The lean urea solution is re-prilled in Urea Plant. Twin objectives of dust free working environment and better quality product has been achieved after commissioning of this system.

The bagging dust collecting system through cyclone separator along with blower & scrubber as shown in the figure -2

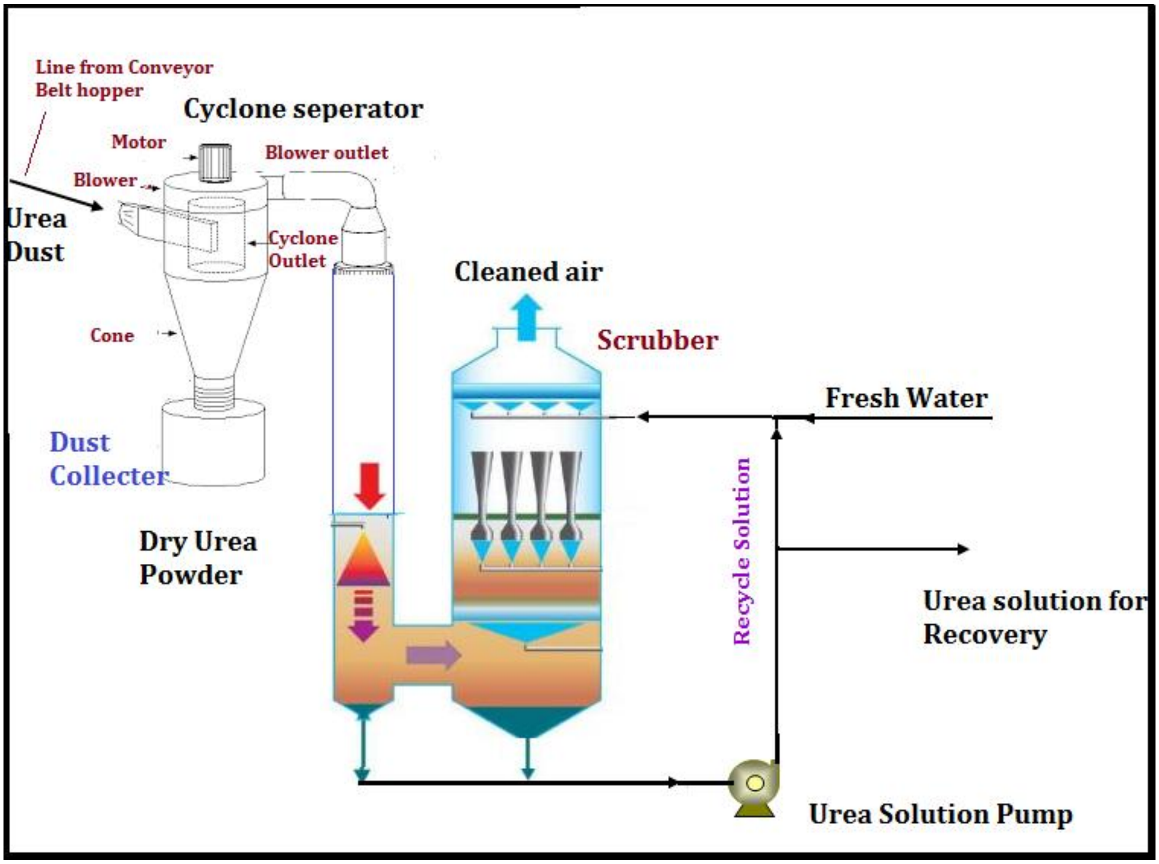


Fig.-2 (Dust recovery system from conveyor belt Hopper)

BIOLOGICAL PROCESS FOR POLLUTION CONTROL SUCCESSFULLY COMISSIONED IN NFL VIJAIPUR

National fertilizers limited, Vijaipur has developed and commercialized a unique and efficient process in 2003 for control of pollution in the urea plant discharge from the fertilizers plant. The process known as Biohydrolizer process. Urea is waste product generated in urea plant. Some bacteria (like Hafnia Alvie 1426), which splits the urea molecule into carbon dioxide and ammonia.

The recently in the NFL Vijaipur Biohydrolizer comissioned.It is the 1st of its kind installed in the country and is very simple. The mixed cutler of urea hydrolyser micro-organism HAFNIA ALVIE-1426 BACTERIA has been developed in laboratory under established parameters maintained in liquid medium. The bioculter is highly resistant even to as high concentration of urea as 20000 ppm present in effluent. It can be hydrolyzed 99% urea in to Nitrogen in 4 to 5 hours, as shown in the figure No.3.

NH_2CONH_2 + Bacteria Hafnia Alvie 1426 +H_2O = CO_2+2NH_3

Urea effluent from urea plant line-I & II (200-900ppm) urea.
Name of Bacteria-“HAFNIA ALVIE 1426”
Residence time-5-6 hrs.

P^H range 6.5 to 9.5
Temperature range-10-50^{0}C

The urea waste from line-I & line-II plant is collected in concrete Buffer tank; the system comprises three concrete tank in series having weir for increasing residence time. The ammonia is removed in air stripping tower and bottom waste sent to urea hydrolyser through buffer tank. The waste feed in Bio hydrolyser subjected to 5-6 hrs. Residence time. The treated waste goes to cleaned pond B, if ammonia content is more than recycle to stripper, this is gravity flow.

Advantages of Bio hydrolyzer

1. No chemical required for urea waste.
2. Low installation cost & No running cost
3. Low space required compared to conventional clarifier.

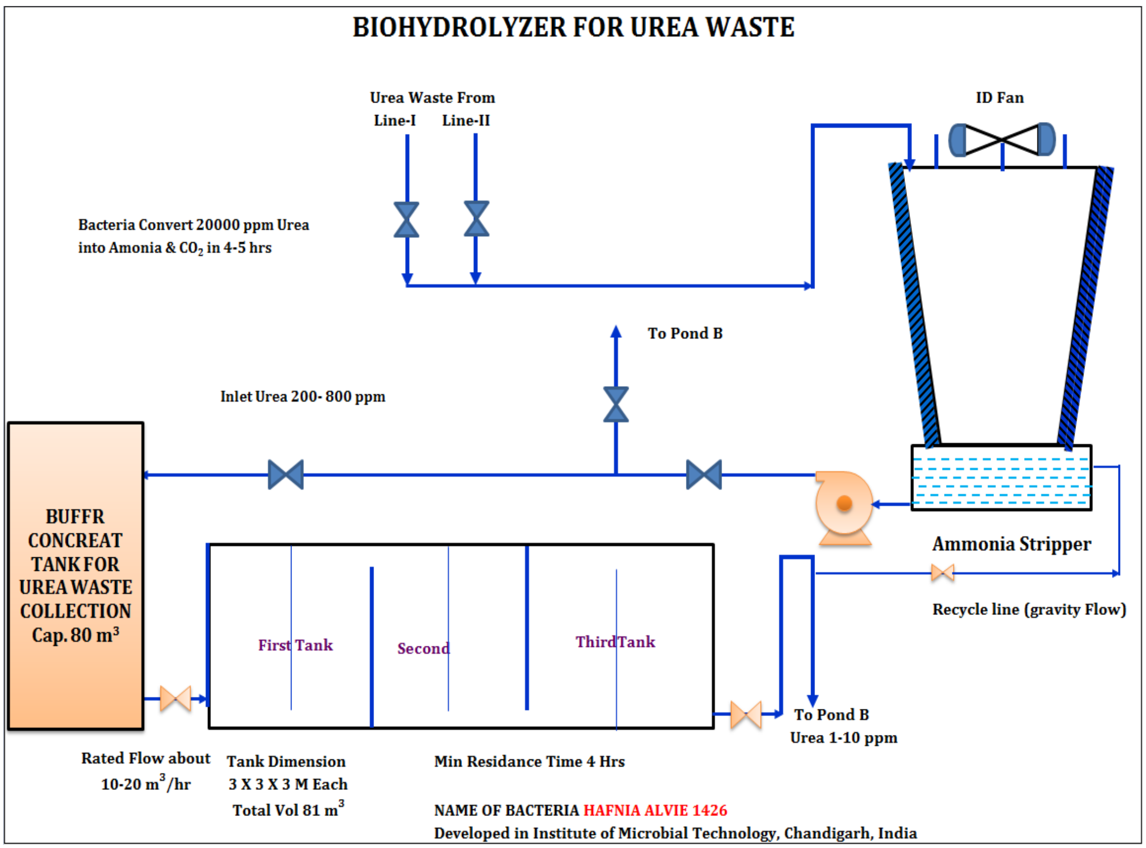


Fig. 3 (Process Flow diagram of Urea Bio hydrolyzer)

CHEMISTRY OF TREATMENT PROCESS

The treatment of waste water generated from the synthesis of Ammonia and urea consists of the following.

1. Cooling water blow down at the rate of 500 m^3/hr. (four No Cooling Tower). .
2. Neutralized waste stream from ammonia plant discharged intermittently for a period of 30 minutes. Total about in 24 hrs 100 m3/day.
3. Acid regeneration waste from DM plant is discharge intermittently at the rate of 50 m^3/hr.
4. Alkaline regeneration waste from DM plant is an intermittent discharge at the rate of 40 m^3/hr.
5. Floor washing from Urea plant line-I and line-II plant is an intermittently discharge at the rate of 20 m^3/hr.

The Chromate treatment and heavy metal precipitation plant consist essentially of chemical treatment for the removal of the following pollutant (however the Chromate treatment has been stopped due to cooling water treatment dosing changed)

1. Removal of hexavalent chromium after its reduction to the trivalent state with sodium metabisufite at a P^H range of 2.0 to 3.0 followed by chemical precipitation as chromium hydroxide $Cr(OH)_3$ with lime at an optimum P^H
2. Removal of Silica from the Cooling Tower blow down, by activated magnesia.
3. Chemical precipitation of heavy metals like Arsenic Copper, Chromium, Nickel, Zinc & vanadium by Sodium sulphide under alkaline condition.

Chemistry of the Treatment Processes.

(A) Chromium Removal

Chemical Reaction

The chemical reaction for reduction of hexavalent chromium to trivalent state with sodium Meta bisulphite at a PH range of 2.0 to 3.0 takes place stoichiometric ally and is an instantaneous reaction according to the following equations.

$$4H_2CrO_4 + 3\ Ca\ (OH)_2 + 3\ H_2SO_4 = 2Cr2\ (SO_4)_3 + 3\ Na_2SO_4 + 7H_2O$$

The Trivalent Chromium is removed as chromium hydroxide by precipitation it with lime at P^H 8.5 to 9.0 as follows.

$$Cr_2\ (SO_4)_3 + 3\ Ca\ (OH)_2 = 2\,Cr\ (OH)_3 + 3CaSO_4$$

The solubility of chromium hydroxide is negligible and is of the order of
$8.4X10^{-4}$ mg/lit at P^H 9.0

(B) Removal of Heavy Metal from neutralized waste derived from Ammonia Plant

The heavy metals present in the neutralized waste water from ammonia plant will be removed by chemical precipitation with Sodium Sulphide

1. **Vanadium :** as Vanadium sulphide

$$V^{+2} + Na_2S = VS + 2\ Na.$$

2. **Arsenic.** as Arsenic Sulphide

$$2As^{+3} + 3Na_2S = As2S3 + 6Na^+$$

3. **Nickel :** as Nickel Sulphide

Ni^{+2} + Na_2S = NiS +$2Na^+$

Ammonia Plants

Provision of separate Low Pressure process condensate stripper in Ammonia-I Plant to remove ammonia and methanol from process condensate, facilitating its re-use after polishing in condensate polishing unit with Ammonia Plant itself, as boiler feed water. Energy efficient high pressure process stripper is designed in Ammonia-II Plant and the condensate from this section is sent to polishing unit in DM Plant.

A neutralization pit has been provided in condensate polishing unit where entire quantity of waste water is neutralized by adding acid or alkali before pumping it to Effluent Treatment Plant.

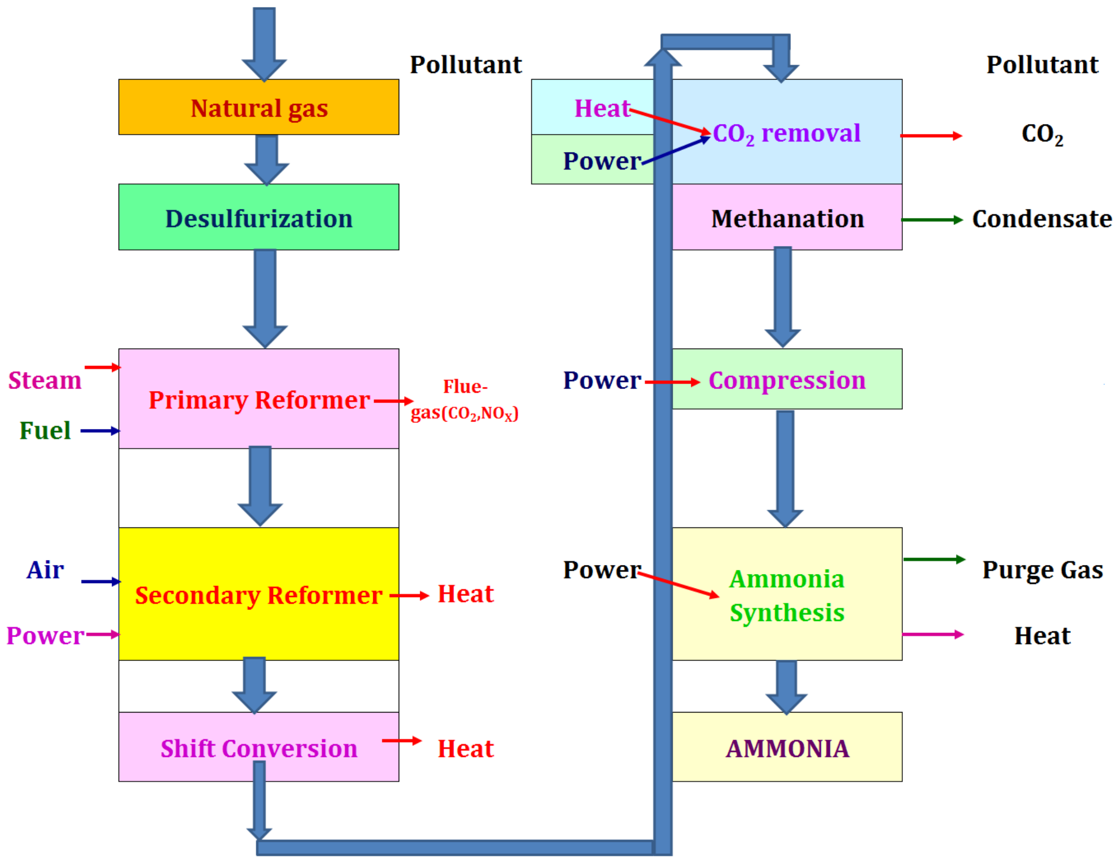
Benfield section is provided with underground channels for collecting spilled potassium carbonate solution. These channels are connected to underground tank. The collected effluent is sent to neutralization tank where it is reacted with ferrous sulphate. After neutralization, it is sent to ETP for further treatment before disposal. Similar system has been provided in GV section of Line-II Plants.

Both in Ammonia-I and Ammonia-II plants oily water from compressor house is collected in slop oil tank and oil is skimmed with the help of Disc Oil Separator. The skimmed water contains less than 10 ppm oil. Water is then sent to Effluent Treatment Plant for further treatment. Following are the ammonia plant pollutants generated.

Permanent emissions from the ammonia plant (one plant)			
Type of emission	**Emission / Source**	**Quantity**	**Composition**
Gaseous	**Flue-gas / Primary reformer**	**120,000 Nm^3 /hr**	**8% CO_2; 3% O_2; 88% N_2 (dry gas); 0.12 mg/Nm^3 SO_2; 500 mg/Nm^3 NO_2; 8 mg/Nm^3 CO**
	Vent gases / CO_2 removal	**25,000 Nm^3 /hr**	**99.7% CO_2 saturated with water vapors**
	Purge gas / Synthesis loop	**3,500 Nm^3 /hr**	**51% H_2; 22.5% CH_4; 5.1% NH_3; 10.2% Ar; N_2**
Liquid	**Process condensate / Shift conversion**	**55 m3 /hr**	**0.8 g/L NH_3; 0.1 g/L CH3-OH; 0.05 mg/L Fe; 0.175 mg/L SiO2**
Solid catalysts	**Hydro desulfurization**	**1.3 m^3 /yr**	**2.5% CoO; 11% MoO_3 / Al_2O_3**
	H2S adsorbent (ZnO)	**3.1 m^3 /yr**	**99% (ZnO + ZnS)**
	Primary reforming	**12.7 m^3 /yr**	**10% NiO / Al_2O_3**
	Secondary reforming	**7.4 m^3 /yr**	**10% NiO / Al_2O_3**
	High temperature shift	**12.5 m^3 /yr**	**74.25% Fe_2O_3; 7.5% Cr_2O_3**
	Low temperature shift	**25 m^3 /yr**	**30% CuO; 45% ZnO; 13% Al_2O_3**
	Methanation	**2.2 m^3 /yr**	**19.5% NiO / Al_2O_3**
	Ammonia synthesis	**12.3 m^3 /yr**	**60% Fe_2O_3; 32.5% FeO; 3.5% Al_2O_3; 3% CaO**

Natural gas or naphtha is used as fuel in all the furnaces at Vijaipur. Since natural gas and naphtha contains almost nil (less than 1 ppm) sulphur compounds and low NOx burners have been used in furnaces, the SO_2 and NOx and SPM in stacks are negligible and the stacks are smokeless.

POLLUTANT EMISSION FROM AMMONIA PLANT



Both the ammonia plants have been provided with separate flare header system and a flare stack to which all vents containing inflammable gases have been connected.

An independent flare stack has been provided for the Ammonia Storage Tanks. The flares are always kept ignited so that complete combustion of effluent gases takes place. The gases released to atmosphere after combustion are completely harmless.

PURGE GAS RECOVERY UNIT

A purge stream is maintained in Ammonia Synthesis loop for maintaining inert gases concentration. Purge stream contains Hydrogen necessary for Ammonia production. H_2 from Purge stream is recovered in PGR Plant. Which otherwise goes to fuel system. As shown in the figure No.4.

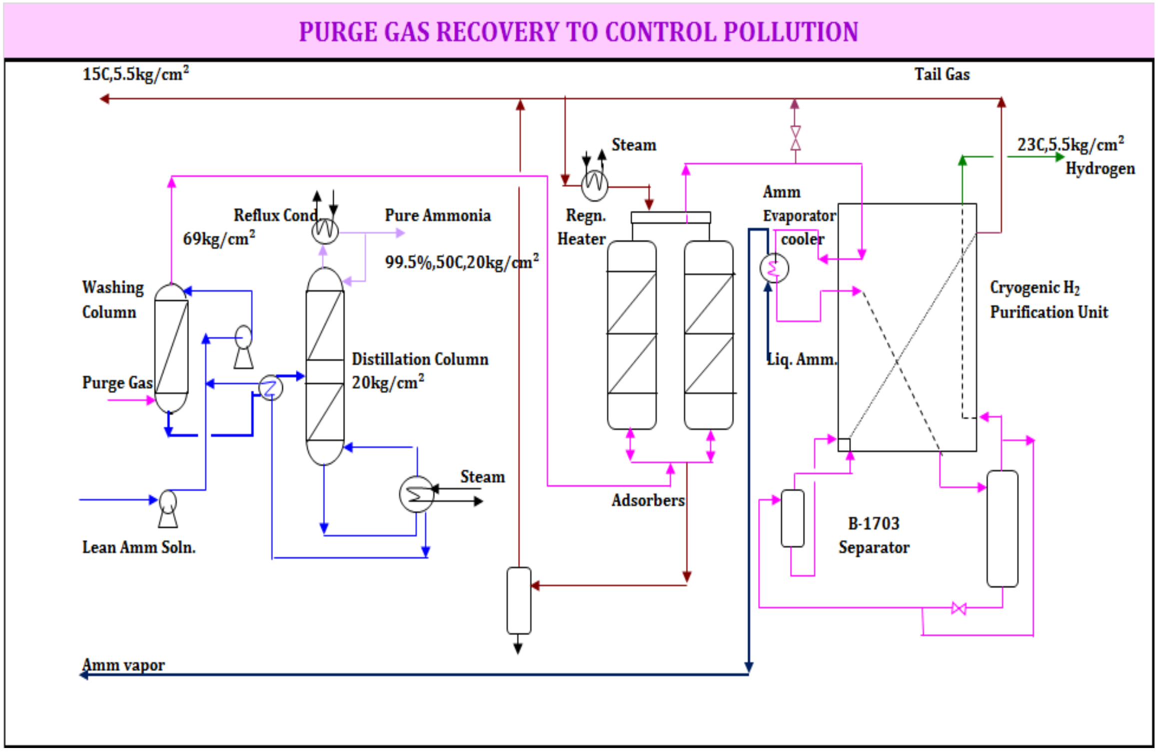


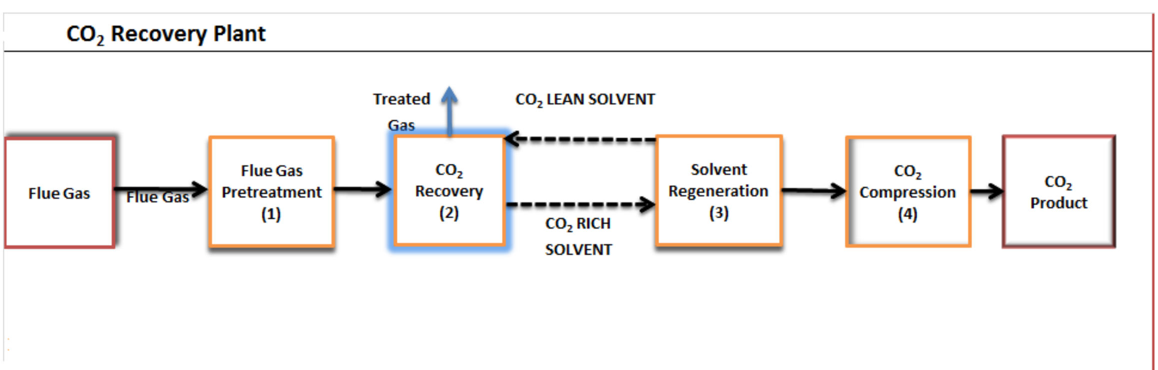
Fig. No. 4

DM Plant

Spent acid and alkali after regeneration is collected in 800 M3 neutralization pit with provision for collection and pumping of acidic, basic and neutral regeneration waste separately. The segregated acid and alkali streams are utilized for neutralization in the Effluent Treatment Plant.

INTEGRATION OF CO_2 RECOVERY FACILITY.

The CO_2 recovery plant is designed to recover 450 metric tons/day of CO_2 from the reformer flue gas or any type of flue gas Recovered CO_2 will be used to inject it into the Urea plant so as to increase the production capacity, or others Product.As shown in the figure No.5.



To reduced greenhouse gases emission the carbon dioxide plant is installed.

CO_2 RECOVERY PLANT

The CO_2 recovery sections consist of four main sections;

1) Flue gas quenching section.
2) CO_2 recovery sections.
3) Solvent regeneration section.
4) CO_2 compression section

The Chemical reactions which take place between carbon dioxide and an aqueous MEA solution generally represented as follows;

$$2(HOCH_2CH_2NH_2) + CO_2 + H_2O = (HOCH_2CH_2NH_3)_2CO_3 \quad (1)$$

$$HOCH_2CH_2NH_2 + CO_2 + H_2O = HOCH_2CH_2NH_3HCO_3 \quad (2)$$

Carbon dioxide can also react directly with MEA to form a carbamate according to the reaction:

$$2(HOCH_2CH_2NH_2) + CO_2 = 2CH_2NHCOONH_3CH_2 \quad (3)$$

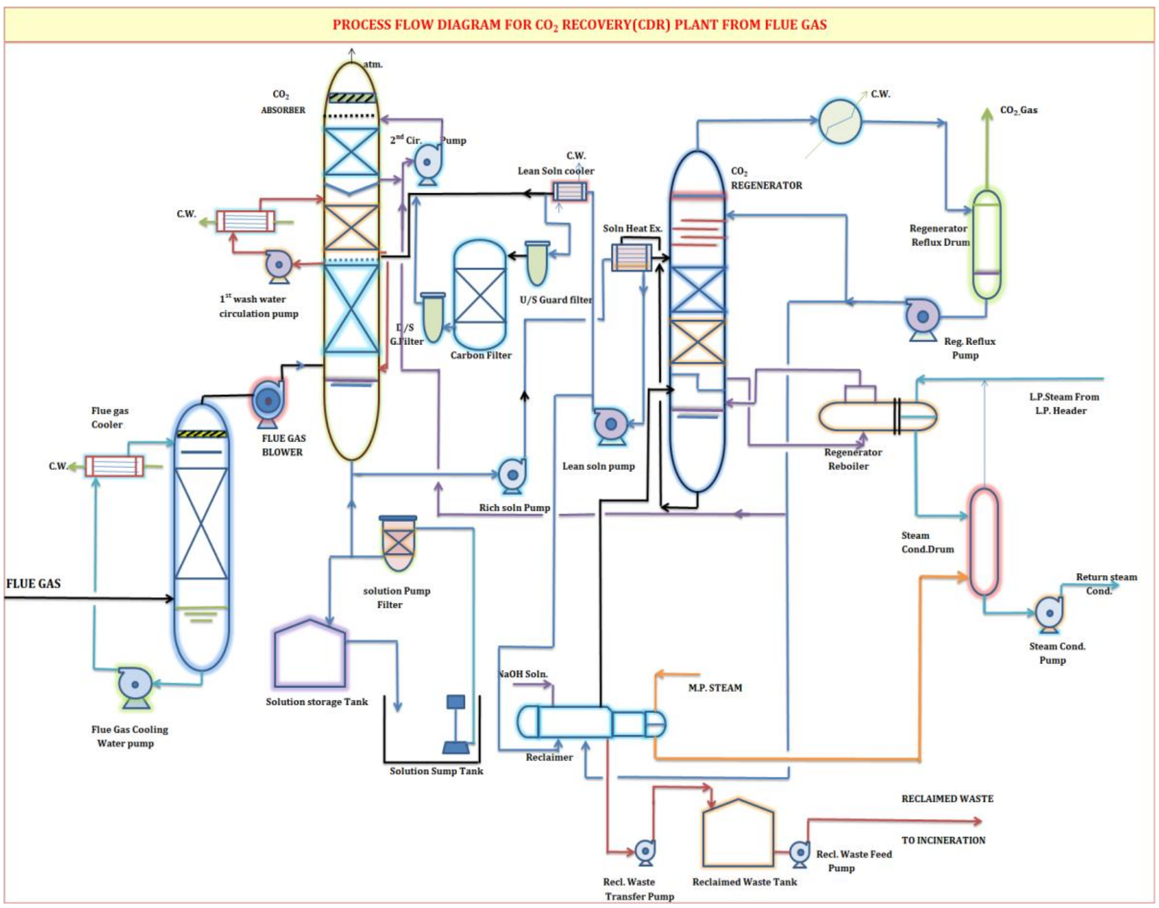


Fig. 5 (Carbon Dioxide recovery Plant)

EFFLUENT TREATMENT

After recycle of pollutants within the plants as per in-built facilities as explained above, the liquid, solid and gaseous emissions from the plants are further treated as under:

Zero liquid effluent discharge has been achieved because of the following integrated effluent treatment facilities:-

i) Re-cycle and Treatment Effluent ponds.

ii) Removal of Ammonia from ammonical effluent in Ammonia Removal Plants.

iii) Treatment of non-ammonical effluent from cooling tower blow down, neutralized waste from Ammonia Plant and Acid and alkali waste from DM Plant. As shown in the figure No.6

iv) Sewage Treatment Plant.

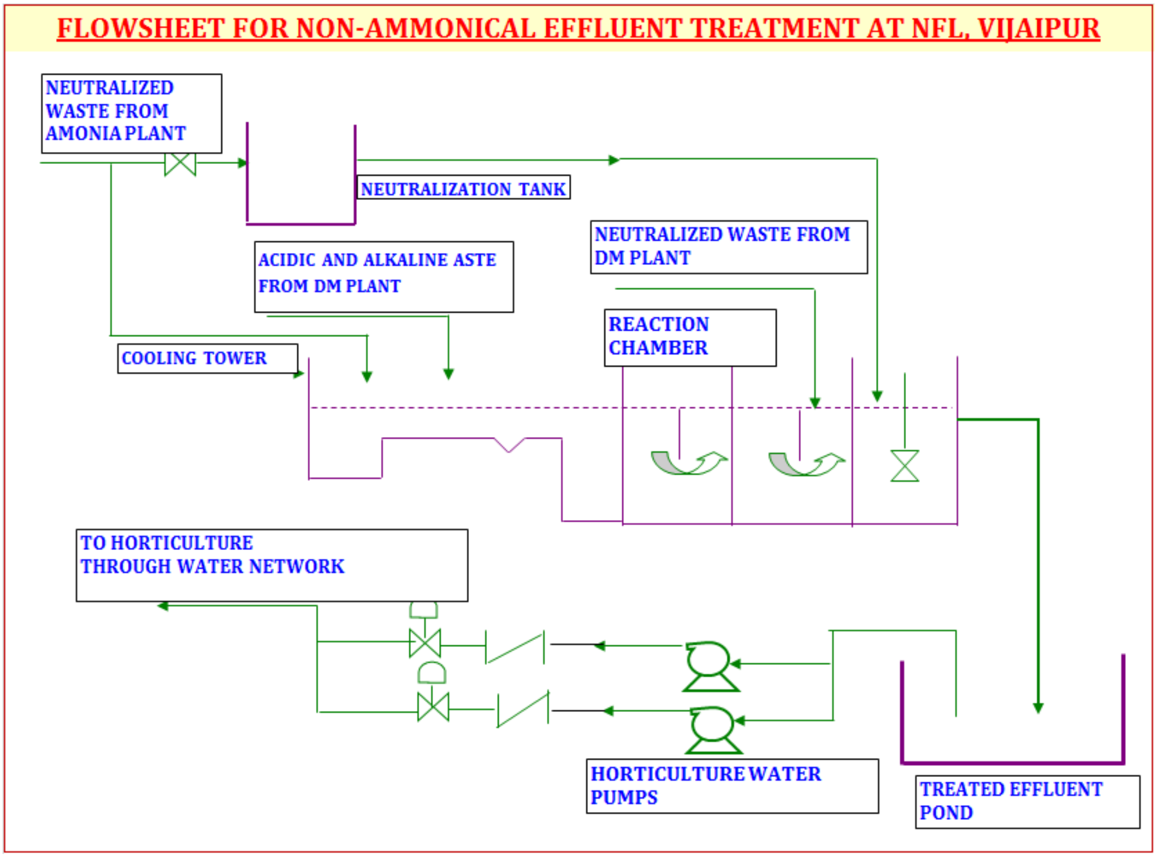


Fig. No.- 6

Effluent Storage Ponds

Two large capacities effluent storage concrete ponds with bitumen polythene linings are integral part of effluent control.

A recycle Pond (Pond A) of 1.1 lakh meter cube capacity has been provided to hold process water from ammonia and urea plant produced during startup, shutdown and process upset conditions. This water is continuously recycled through air and steam stripper to remove ammonia.

A treated effluent pond of 2.2 lakh meter cube capacity has been provided for equalization before discharge.

Effluent from Pond A after treatment is sent to Pond B. Treated effluents from entire complex and storm water drains are sent to Pond B. The quality of water in Pond B is always maintained much lower than MINAS limits. The treated water from Pond B is finally pumped to horticulture water network.

Ammonia Removal Plant

The urea and ammonia removal unit comprises of an Air and 3 Nos. steam strippers. Effluent from recycle effluent pond is re-circulated through air stripper to reduce ammonia content in the effluent. Part of water is stripped in steam strippers and the treated water is sent to Pond B.

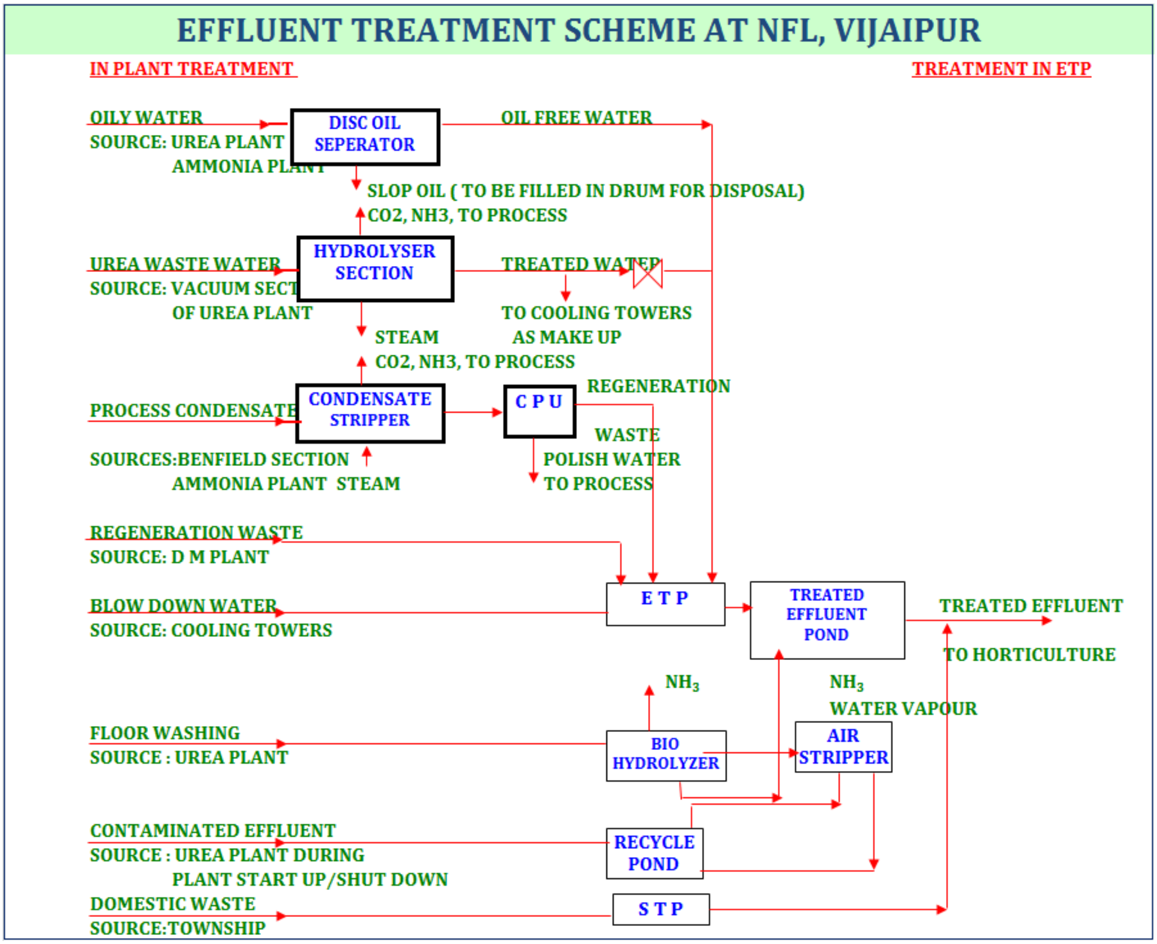


Fig. No. 7

Treatment of Non-ammonical effluent

The Effluent Treatment Plant has been designed for treating cooling tower blow down, neutralized waste from Ammonia Plants and acid and alkali wastes from DM Plants.

Blow down Cooling Towers does not require any specific treatment and flows to Effluent Treatment Plant. Similarly only pH correction is required for effluent emanating from DM Plant which is carried out by 10% lime solution if required.

Sewage Treatment Plant

A sewage treatment plant (STP) of 150 M^3/hr. capacities has been installed for removal of organic matter from the incoming sewage. Extended aeration process has been adopted for sewage treatment. The treated water STP is pumped to horticulture water network for green belt development. As shown in the figure No.8. The sanitization technique studied is addition of urea to sewage sludge. At sufficiently high concentrations ammonia becomes toxic to microorganisms.

Achieving sanitization through urea treatment has been studied for various organic materials; such as source separated dry material, co-compost and single use biodegradable toilets. The method has in these studies been found effective. Sludge from sewage treatment plants can contain human excreta; faeces and urine, flushing water, grey water, storm water and water from industries in varying fractions. Additionally, at the end of the treatment process there will be a large amount of biomass which has grown during biological treatment.

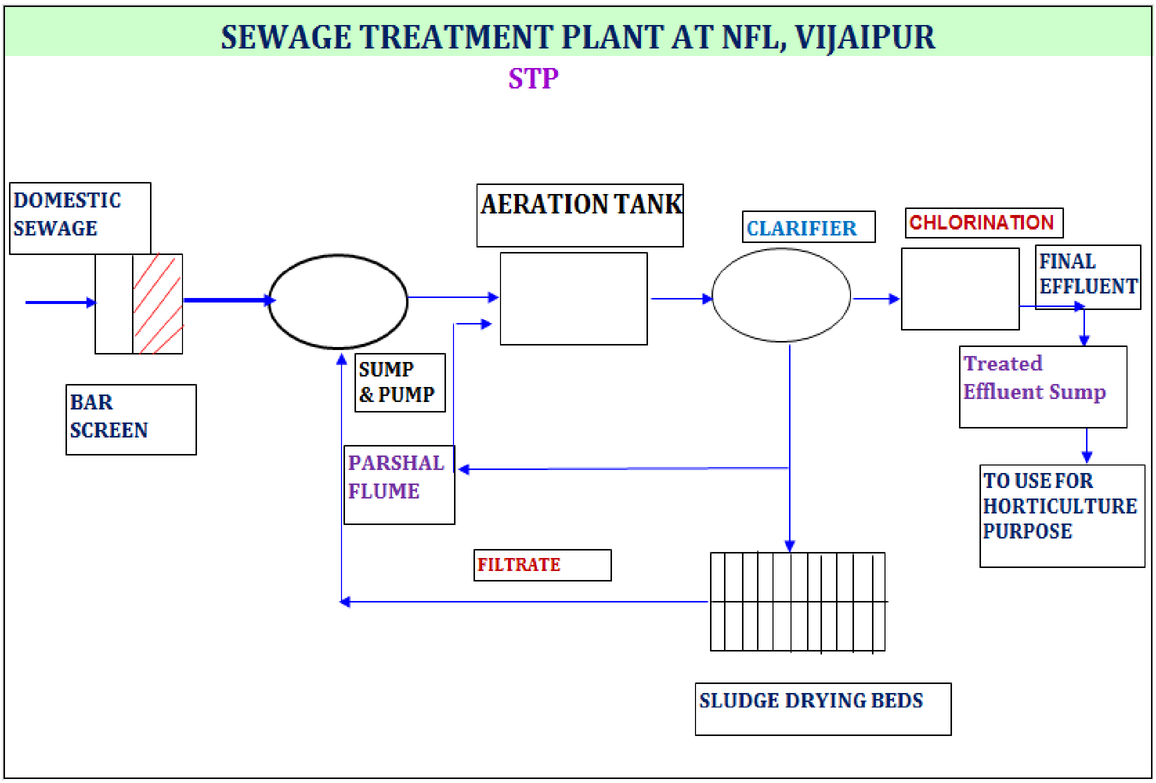


Fig. No. 8 (sewage Treatment Plant (STP)

Horticulture Water Network

The entire quantity of treated water from plant and sewage treatment plant is utilized for horticulture purposes within our complex. This water is fed through a network of pipes laid for the factory area, lawns and gardens of public buildings and non plant buildings, kitchen gardens and Van Vihar. The irrigation pipe network consists of about 35 Kms. of steel pipe of different diameters ranging from 50 mm to 500 mm.

Solid Waste Pollution Control

Urea dust generated during material handling is re prilled after dissolving in hot condensate in Urea Plant.

The non hazardous sludge separated in water Pre-treatment Plant mainly consists of silica & clay. It is dried in sludge drying beds and then used for land fill inside factory premises.

Air Pollution Control

Built in provisions have already been incorporated in the Plant design to ensure gaseous discharge within MINAS. Ambient air quality is being analyzed at five ambient air quality monitoring station inside the factory premises. The level of pollutants are well within statutory / MINAS limits.

Noise Pollution Control

Silencers have been provided at vents to reduce noise level in the surrounding areas. Thick Plantation has been carried out around the boundary wall to reduce the sound level. The noise level at different places inside as well as outside the factory premises are well within the limits.

PROBLEMS FACED AND REMEDIAL MEASURES TAKEN

Problems faced and remedial measures taken along with some improvements pertaining to effluent treatment are as under:-

Provision of additional Stripper

As per original effluent treatment scheme, a 16 cubic meter/ hr. steam stripper was envisaged and provided to polish effluent from Pond-A to the specified statutory limits as per MINAS, for transferring to the Treated Effluent Pond (B). However, because of accumulated off-grade effluent in Pond-A it was felt that one number Steam Stripper was inadequate. Another stripper was designed, fabricated, erected and commissioned by NFL utilizing plant resources and expertise.

Changer over of Cooling Water Treatment from Chromate to Non-Chromate

NFL recognized that the use of chromium based chemical treatment for cooling water was hazardous from environmental point of view. Cooling Water Treatment was successfully changed over from chromate to non-chromate in July 1991. Cooling Water blow-down consisting mainly of 1-1.5 ppm zinc and 3-4 ppm phosphate flows to Treated Effluent Pond (Pond B).

Removal of suspended solid from PTP sludge

In Pretreatment Plant for removal of turbidity lime and alum solutions are added. The sludge from Pre-treatment Plant contains high-suspended solids. After operation of the plant for about two years, it was observed that the suspended solids had traveled up to river chopan(name of the river). Three numbers sludge lagoons of 1000 cubic meter cap. Each were constructed to collect sludge water from clarifiers. The clear water is being recovered from lagoons and pumped to raw water inlet stream for re-use. The dried sludge from the lagoons is being utilized for earth filling.

ENVIRONMENTAL MANAGEMENT

Since beginning itself, NFL Vijaipur Management has given top priority for conservation and improvement of environment. Environmental Audit from third party, extensive tree plantation and setting up Environment Monitoring Cell are some of the key concepts that have helped in significant improvement in the environment around Vijaipur.

Environment Monitoring Cell

At NFL Vijaipur an Environment Monitoring Cell has been constituted since commissioning of Line-I to keep a continuous vigil on the environmental conditions in and around fertilizers complex. The activities of the call are as under:-

i) Daily analysis and monitoring of all the drains emanating from the factory premises. Timely remedial action is initiated in case of any deviation.

ii) Ensuring round the clock compliance of statutory requirements.

EIA from third party.

External third party agencies such as NEERI, Nagpur & Regional Research Laboratory, Bhopal were entrusted with special studies for environmental audit with a view to monitor environment and suggest remedial measures for improvement.

National Environmental Engineering Research Institute (NEERI), Nagpur had carried out a comprehensive EIA after commissioning of Line-I Plants and a Rapid EIA before clearance of Vijaipur-II Project. As per NEERI, NFL has a positive impact on environment because of significant improvement in social environment of the villagers living around NFL. There has been improvement in availability of transportation, communication, electricity, water, employment, marketing facilities, educational facilities, medical facilities etc. To continue the improvement in environment, another Comprehensive Environmental Impact Assessment study is in hand which is likely to be completed in the year 2000.

Regional Research Laboratory, Bhopal had carried out a comprehensive study to predict impact on ground water quality due to long-term application of treated effluent on land at NFL, Vijaipur.

Tree Plantation and Green Belt Development

To improve the ecological balance, a programme has been taken up for extensive tree plantation in and around the NFL complex. This barren stretch of land which had no trees to start with, has now 2,10,000 trees covering approx. 212 hectares. The greenery within the NFL Complex is testimony to the efforts made by NFL for improvement in environment.

We have an annual target to add about 10,000 trees to further enrich the environment.

Just after commissioning of Line-I Plants it was observer that the plants were well designed to take care of effluent during normal running operation. However, during rainy season and shutdown, possibility of escape of ammonical water from storm water drains was observed. Also, the land on which the plant is situated comprises of fissured rock and is not capable of holding water. To take care of the effluent in the storm water drains escaping the factory premises, zero effluent discharge was achieved by diverting water from the drains to specially constructed ponds with the help of diversion gates. These ponds are provided with three pumps each and pipelines up to pond A and Pond B to pump the water to the ponds depending upon the quality. Subsequently main drain emanating from Urea and Ammonia Plants was regarded so that water in this drain flows by gravity to Pond-A or Pond-B entire quantity of water from the factory premises, whether piped or from storm water drains, after treatment is sent to Pond-B for equalization. The treated water from Pond-B is then pumped to the horticulture water network for use in the Van Vihar , kitchen garden, lawns etc developed on the NFL's land.

ISO-14001

The International Community has recognized the efforts of NFL management towards Environmental Management when NFL Vijaipur Unit was awarded ISO-14001 certification in February 1999. After completion of stringent environmental audit by KPMG, Netherlands and independent internationally recognized

Conclusion-

A coordinated approach comprising of an effective utilization of available asset, development of Biohydrolizer regular laboratory analysis assisted by advanced continuous treatment. This exercise has proven reliability and sustainability of the system. The NFL exercise is valuable for new development at lower cost and no running cost no chemical required for treatment. The main objective was to reduce urea content in treated water to less than 1 ppm so that it can be used as any service as requirements. Considerable quantities of ammonia and urea arc discharged continuously along with the vacuum condensate. In modern urea plants, the quantities of ammonia and urea discharged has been reduced appreciably be process modification. Some urea and ammonia are occasionally discharged which originate from spillage, leakage of glands, flanges, joints, etc, floor washings and also from draining during shutdown and start-up of plants, In modern plants these discharges are collected and recycled. A stream of cooling water purge containing conditioning chemicals and biocides is discharged from the cooling tower continuously; the nutrients can be used in horticulture after treatments. The method is low cost and at the same time enhances the fertilizer value of sewage sludge. It therefore has a large potential of competing with more established methods of sanitization.

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