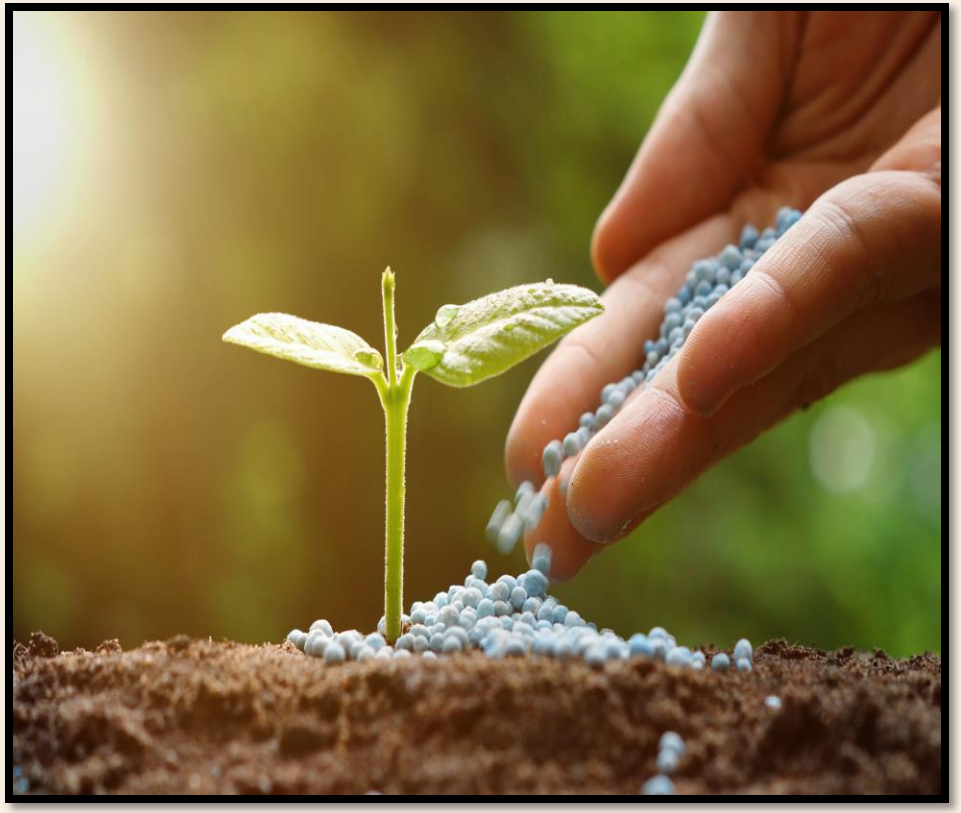
Fertilizer And Pesticides Industries

Fertilizer

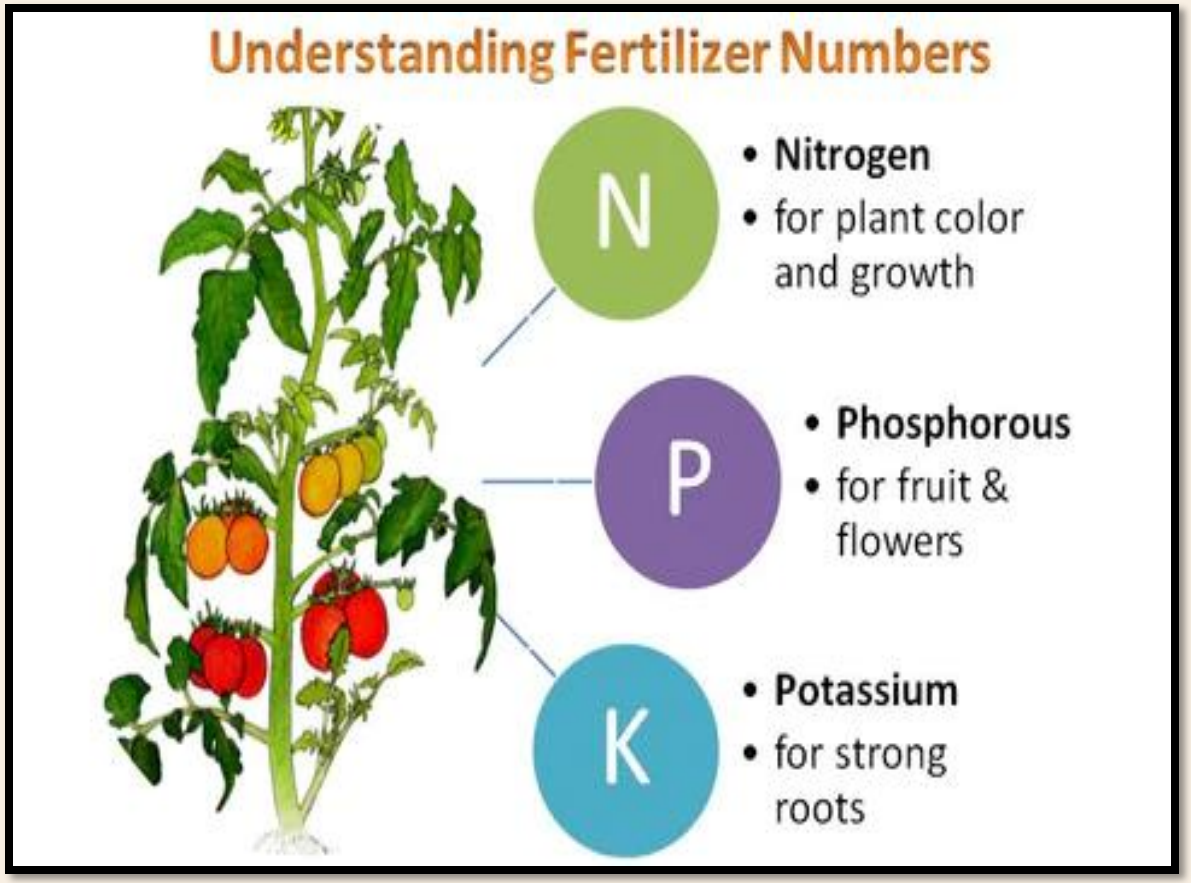
Description:

- Fertilizer is a substance **added to soil to improve plants growth and yield.**
- Fertilizer are composed of **nitrogen, phosphorus** and **potassium** compounds.
- Plants are depend on nutrients in the soil to provide the basic chemicals for these metabolic reactions.
- Fertilizers **replace** the **chemical components** that are taken from the soil.



Fertilizers can be grouped into:

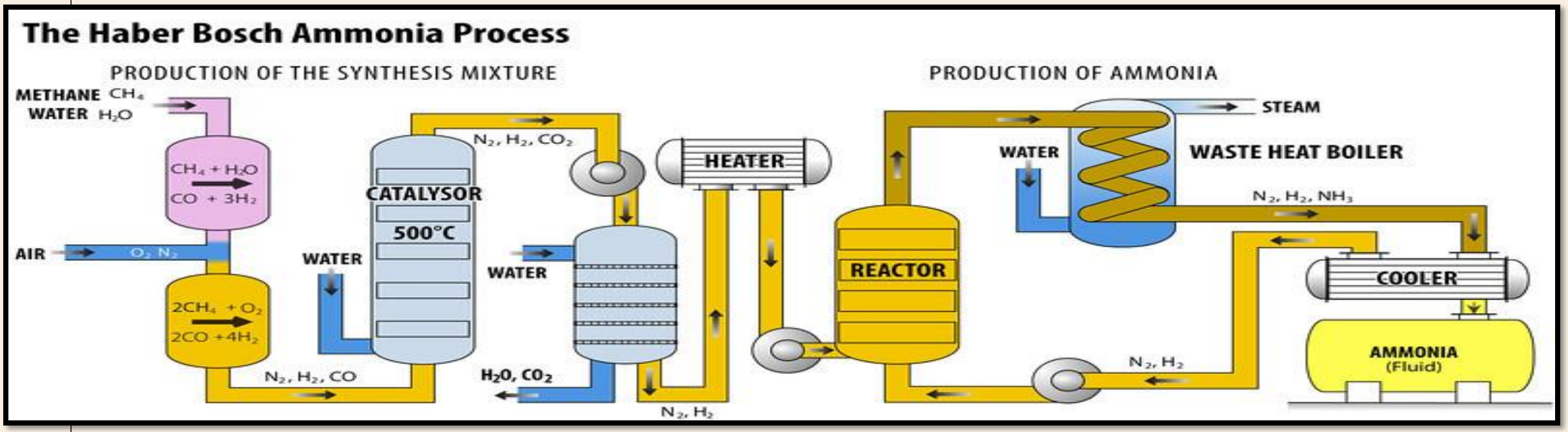
- **Nitrogenous**, e.g. Urea, ammonium sulphates, ammonium nitrate, ammonium chloride.
- **Phosphatic**, e.g. superphosphates
- **Complex**, e.g. ammonium phosphate and ammonium sulphates- phosphate
- **Potassic**
- **Chemicals** required in the production of these fertilizers are mainly sulphuric acid, nitric acid, naphtha, carbon dioxide and phosphoric acid.



Manufacturing Process

Ammonia synthesis: a mixture of pure nitrogen and pure hydrogen in proportion 1:3 by volume is compressed under 200 atmospheric pressure and passed through chamber (catalyser) heated to 500-550 degree Celsius, containing finely divided iron (which acts as catalyst) and molybdenum(acts as promoter).

Nitrogen combines with hydrogen to form ammonia.



Urea Synthesis:

- ✓ **Naphtha or natural gas is treated with steam and hot air** to produce carbon monoxide, carbon dioxide and hydrogen.
- ✓ **Carbon dioxide is separated** and sent to urea synthesis plant.
- ✓ Separation is done by using potassium carbonate, monoethanolamide, diethanolamine and caustic soda.
- ✓ **Ammonia** from ammonia synthesis is **reacted with carbon dioxide to form urea.**
- ✓ The liquid is filtered and subjected to **vacuum crystallization.**
- ✓ Crystals are separated by **centrifugation**, dried and remelted.
- ✓ Molten urea is pumped into top of prilling tower and is sprayed against current of hot air.
- ✓ Spherical prills of area are formed at the bottom of the tower, where they are collected.

Sources of Wastewater

Process Water

Process Intermediates

Final Products

Oil bearing wastes from compressor house and boiler house.

Wash water from gas scrubbing towers.

Regeneration and rinse waters from demineralisation plant.

Cooling tower and boiler blowdowns.

Phenols and cyanides, if ammonia is extracted from ammonical liquor of coke ovens.

Characteristics of wastewater

A) Phosphatic Acid or ammonical effluents

B) High fluoride

C) Low pH

D) High phosphate

E) High suspended solids

These characteristics vary over a wide range depending on:

- Raw materials used,
- Method of manufacture
- Housekeeping practices follow, reuse and recycling practices followed, if any.

Disposal of Wastewater

- **Disposal at sea:** Minimum treatment required disposal before disposal is removal of components which could damage, corrode or form incrustations in the pumps, piping and outfall. In addition, a thorough study of the ocean currents and their mixing characteristics is required to decide the length of the outfall.
- **Disposal into River:** Treatment required for removal of toxic substances to avoid fish kills, prevent deterioration of downstream water supplies, avoid eutrophication.
- **Disposal into Land:** Removal of pollutants harmful to soil organisms and reduction of total dissolved solids to less than 2100mg/L.

Method of Treatment

- Ion Exchange, strong acid resin, weak acid resin, air stripping.
- Neutralisation
- Sedimentation
- Clarification

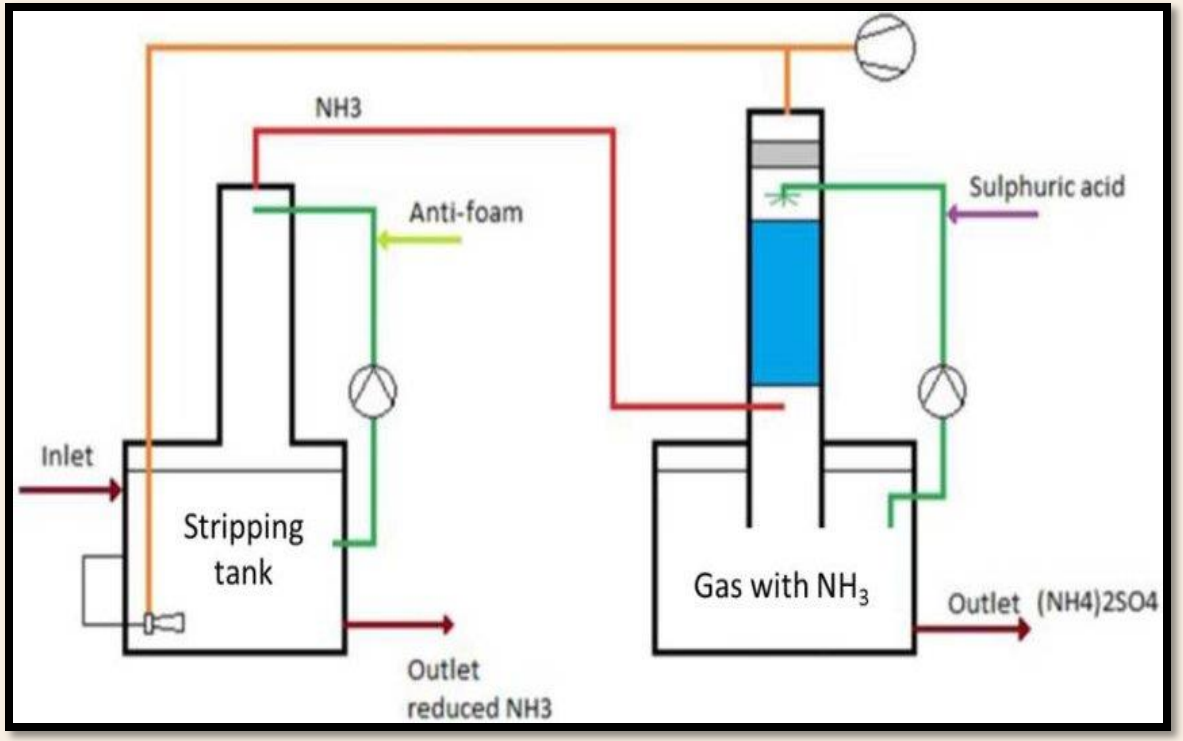
Ammonia removal is done by:

I) Air stripping

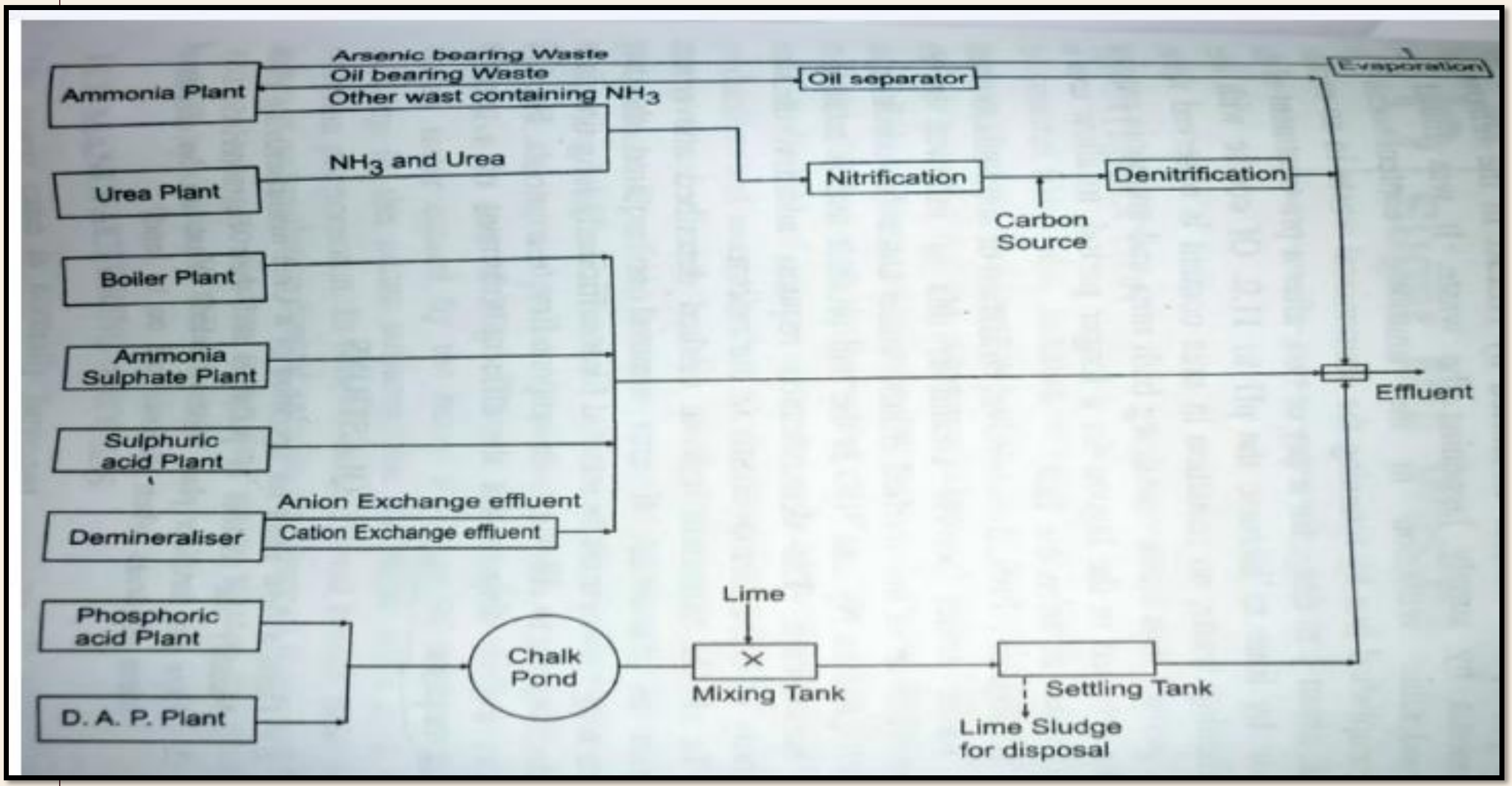
II) Stream stripping

III) Lagooning after pH adjustment

IV)Nitrification and denitrification



Ammonia removal by Stripping



Flow Diagram For Effluent Treatment For A Complex Fertilizer Plant

Pesticide Industry

Pesticides

Description:

Pesticides are substances meant for **attracting, seducing and then destroying any pest.**

- They are a class of **biocide.**
- The most common use of pesticides is as **plant protection products**(also known as crop protection products), which in general protect plants from damaging influences such as weeds, fungi, or insects.
- The use of pesticides is often treated as synonymous with plant protection product, although it is in fact a broader term, as pesticides are also used for non- agricultural purposes.

Pesticides commonly used in agriculture can be grouped as:

- **Insecticides:** organochlorines, organophosphates, carbamates and synthetic pyrethroids
- **Organic fungicides and bactericides:**

  Dithiocarbamates, dicarboximides, systemic fungicides and benzimidazoles
- **Organic herbicides:** phenoxyaliphatic acids, nitroanilines, Ary aliphatic acid and bipridylium.

Type of Pesticide	Target Pest
Fungicides	Fungi
Insecticides	Insects
Herbicides	Plants (weeds)
Nematicides	Nematodes
Rodenticides	Rodents
Acaricides/Miticides	Spiders, mites
Molluscicides	Snails, slugs
Bactericides	Bacteria
Algicides	Algae
Avicides	Birds

These pesticides persist in water and soil for long time, the factors affecting their persistence depending on the:

a) Nature of pesticides,

b) Nature of water,

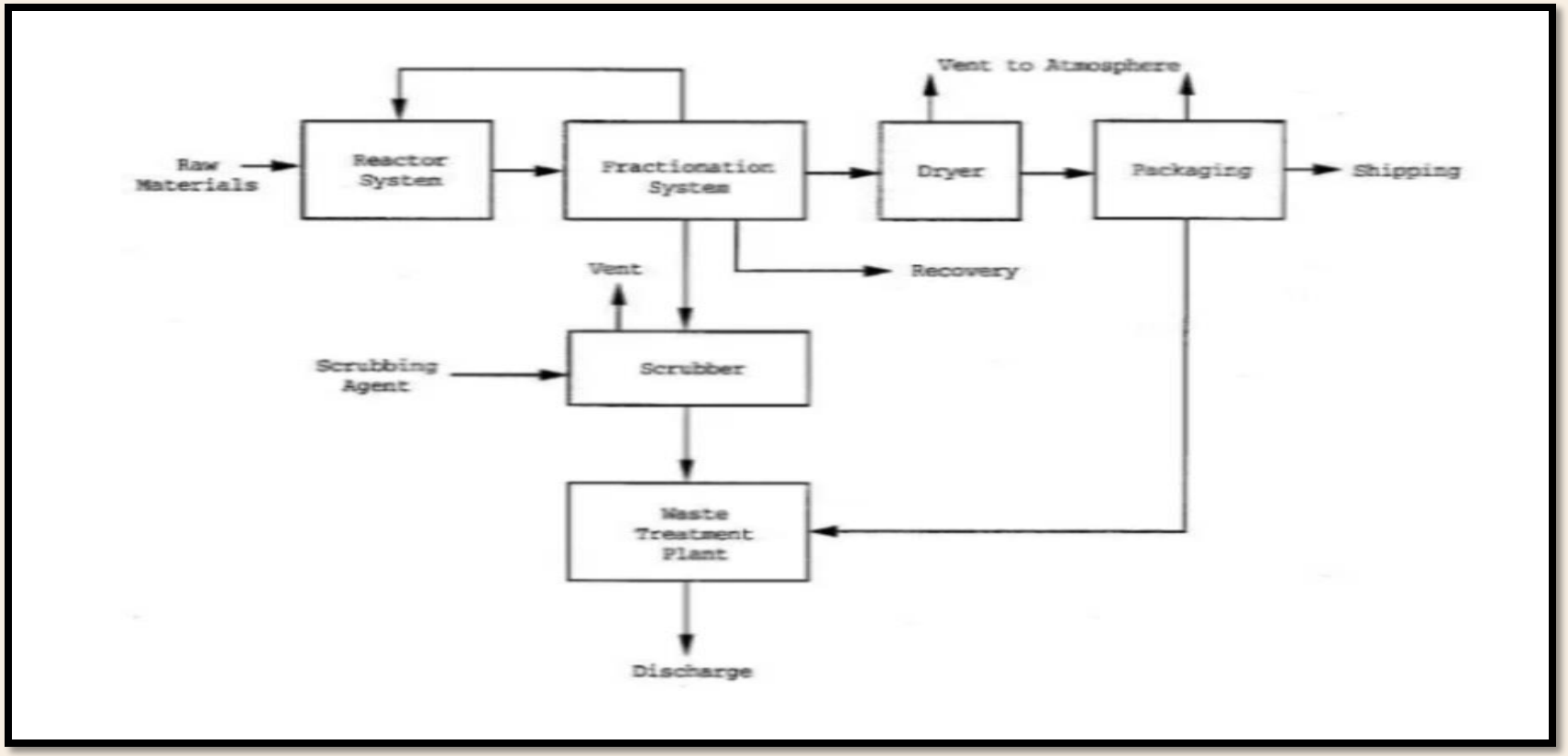
c) Properties of the soil

Most pesticides undergo partial or complete decomposition when exposed to light: the photodecomposition is limited to only the upper layer of the soil.

Manufacturing processes of few pesticides:

Carbaryl, parathion and methyl parathion , malathion, benzene hexachloride(BHC).

Manufacturing Process: Technical Grade Pesticides (substances that are intended to control pests)



Raw Material: In the manufacturing process of malathion the raw materials used are DDPA (dimethyl-dithio phosphoric acid) and DEM(dimethyl maleate). For DDT chlorine and ethanol, chlorobenzene are used as a raw material.

Water Consumption And Waste Generation

- ✓ Wastewater generated from pesticides manufacturing processes consists of reaction water from chemical processes, process solvent water, process stream wash water, product wash water, spent acid etc.
- ✓ Because of the nature of pesticides and their components, wastewaters generated from manufacturing plants usually contain toxic.
- ✓ The pollutants or groups of pollutants likely to be present in raw wastewater include halomethanes, cyanides, halo ethers, phenols, heavy metals ,pesticides etc.
- ✓ Washing and cleaning operations provide the principal sources of wastewater in formulating and packaging operations.
- ✓ Because these primary sources are associated with clean-up of spills, leaks, area wash downs, and storm water runoff. Wastewaters from formulation and packaging operations typically have low levels of BOD, COD and TSS, and pH is generally neutral. Also use of wet scrubber contributes to the waste water generation.
- ✓ Waste water contributes from packaging of technical grade pesticides.

Characteristics of wastewater

- Benzene ring
- High organic matter
- Strong – highly acidic
- Highly toxic

Source Reduction Options

- ✓ The first step is to prepare an inventory of the waste sources and continuously monitor those sources for flow rates and contaminants.
- ✓ The next step is to develop in-plant operating and equipment changes to reduce the amount of wastes.
- ✓ The following are some of the techniques available for the pesticides manufacturing facilities.
- ✓ **Waste segregation** is an important step in waste reduction.
- ✓ **Separate equalization for streams** of highly variable characteristics is used by many plants to improve overall treatment efficiency. This is especially applicable for situations where liquid or solid materials have been spilled.
- ✓ **Flow measuring devices and pH sensors with automatic alarms** to detect process upsets are two of many ways to effect reductions in water use.
- ✓ **Prompt repair and replacement of faulty equipment** can also reduce wastewater losses.
- ✓ **Reactor and floor Wash water, surface runoff, scrubber effluents and vacuum seal water** can be **reused.**

Method of treatment

Simply by dumping into sufficient dilution stream such as ocean.

Method of treatment include chemical, Physico- chemical, biological and physical steps, the general sequence being:

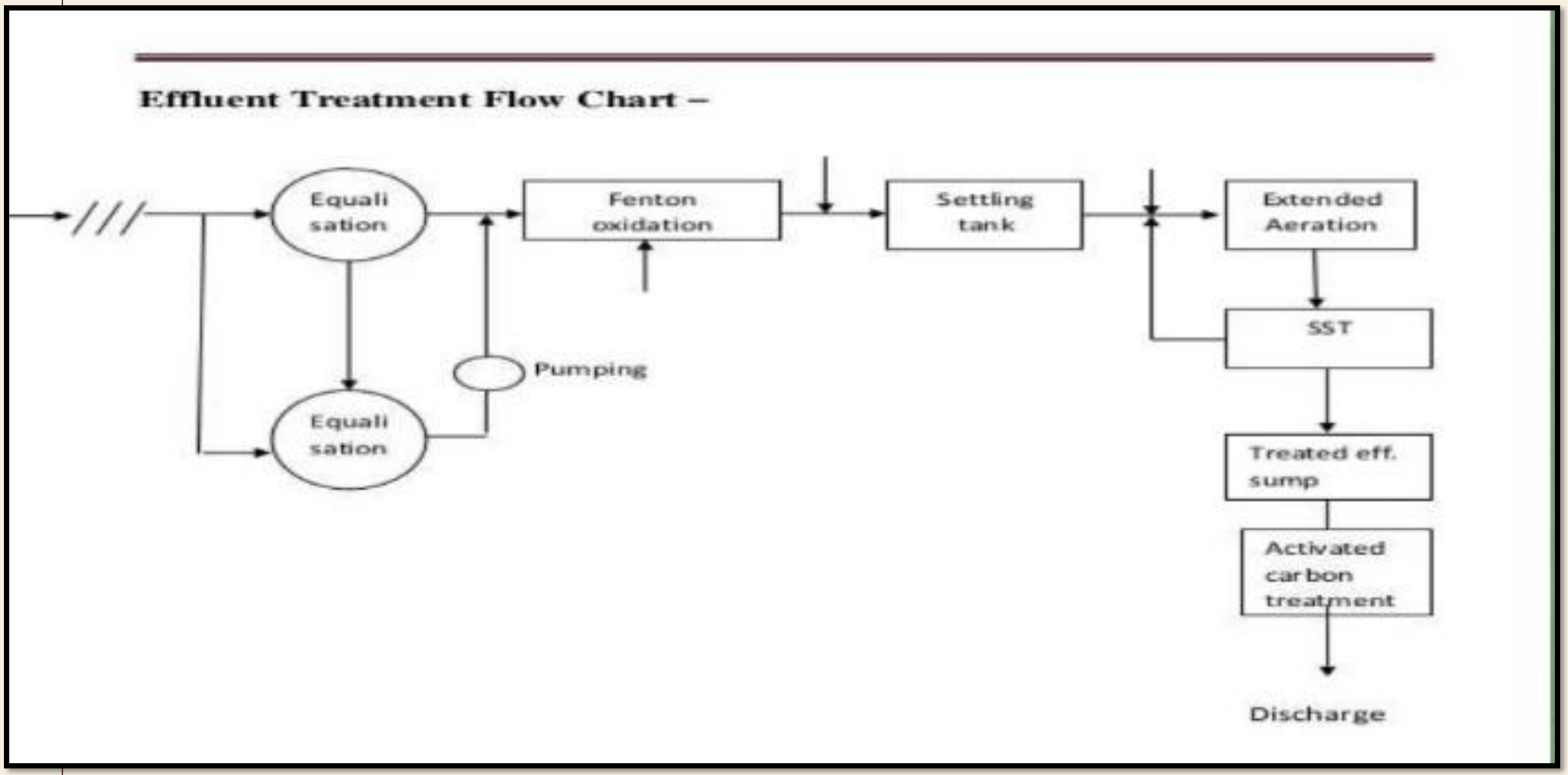
a) **In-plant control,**

b) **Chemical treatment, pH correction** by using lime, or sodium hydroxide or anhydrous ammonia, oxidation with chlorine , ozone, potassium permanganate, hydrogen peroxide has been successful in removing the active components of the pesticides.

c) **Coagulation**

d) **Adsorption,** and

e) Biological treatment include **activated sludge process, trickling filtration, Aerated lagoons and waste stabilisation ponds.**



Effluent treatment flow chart for pesticide plant

- **Screening:**

  Fine mesh screens are provided to **remove fine matters from pesticide wastes.**

- **Equalisation tank-**Equalization tank provided in pesticide industry consists of a wastewater holding vessel or a pond large enough to dampen flow and/or pollutant concentration variation that provides a nearly constant discharge rate and wastewater quality. The **detention time taken here is about 24 hrs**. In this there are 2 equalisation tanks are provided.

- **Settling tank-**The NaOH is added to the settling tank for the **correction of pH** before the extended aeration process.

- **Fenton oxidation-**In this the dose of H202 is given about 2500mg/l for the oxidation & FeSO4 as a catalyst dose about 833mg/l. With the ratio about H202:Fe as 1:3. & removal percentage is about 80%.Before the Fenton oxidation the acid dosing is given for the lower the pH value because it will work only at lower pH value. **After the Fenton process the pH is increased by addition of NaOH.**

- **Extended aeration**-The extended aeration is complete **mix flow regime.** The process employs **low organic loading, high MLSS, long detention time, low F/M.** As the influent coming from the pesticide waste the assumed removal efficiency is here about 65%.
- **Secondary settling tank (SST)** -The biomass is generated in the aeration tank is **flocculent** & **quick settling** it is separated from the aeration sewage in secondary tank & recycled continuously to the aeration Tank as essential future of the process.
- **Effluent sump**-The treated effluent is **collected** in this sump & is given for the further treatment of activated carbon.
- **Activated carbon treatment** -Activated carbon adsorption is **process for adsorption of organics in wastewater from pesticide industry.** In the pesticide industry, GAC is widely used. The treatment removes the concentration of pesticides at very low level. The effluent from the sump is **pumped into the activated carbon tower.**


Thankyou...