TEXTILE WASTE WATER TREATMENT

INTRODUCTION

- Waste water is generated in the processing of cotton, wool, semi-synthetics, synthetics, silk, jute, rayon, etc.
- Raw material used in the manufacturing process are subjected to various physical, chemical &biological changes which removes natural impurities from raw material, separating the cleaned portion and modifying its physical & chemical str. to get desired end product.
- These natural impuirites, along with the chemicals & other cleansing agents used in the process find their way into the waste water streams & contribute to their polluting characteristics.
- Methods of disposal of treated wastes are determined by local conditions & requirements of pollution control authorities.
- Textile industry offers good opportunities for effective treatment of its waste water, recovery of valuable chemicals & by-products form wastes, recycle & reuse of water used in manufacturing process.

POLLUTANTS IN TEXTILE EFFLUENTS

- Suspended solids
- Mineral oils , grease
- Non-biodegradable or low biodegradable surfactants
- Potential microbiological pollutants
- Residual chlorine, halogenated organics
- Sulphur , sulphide

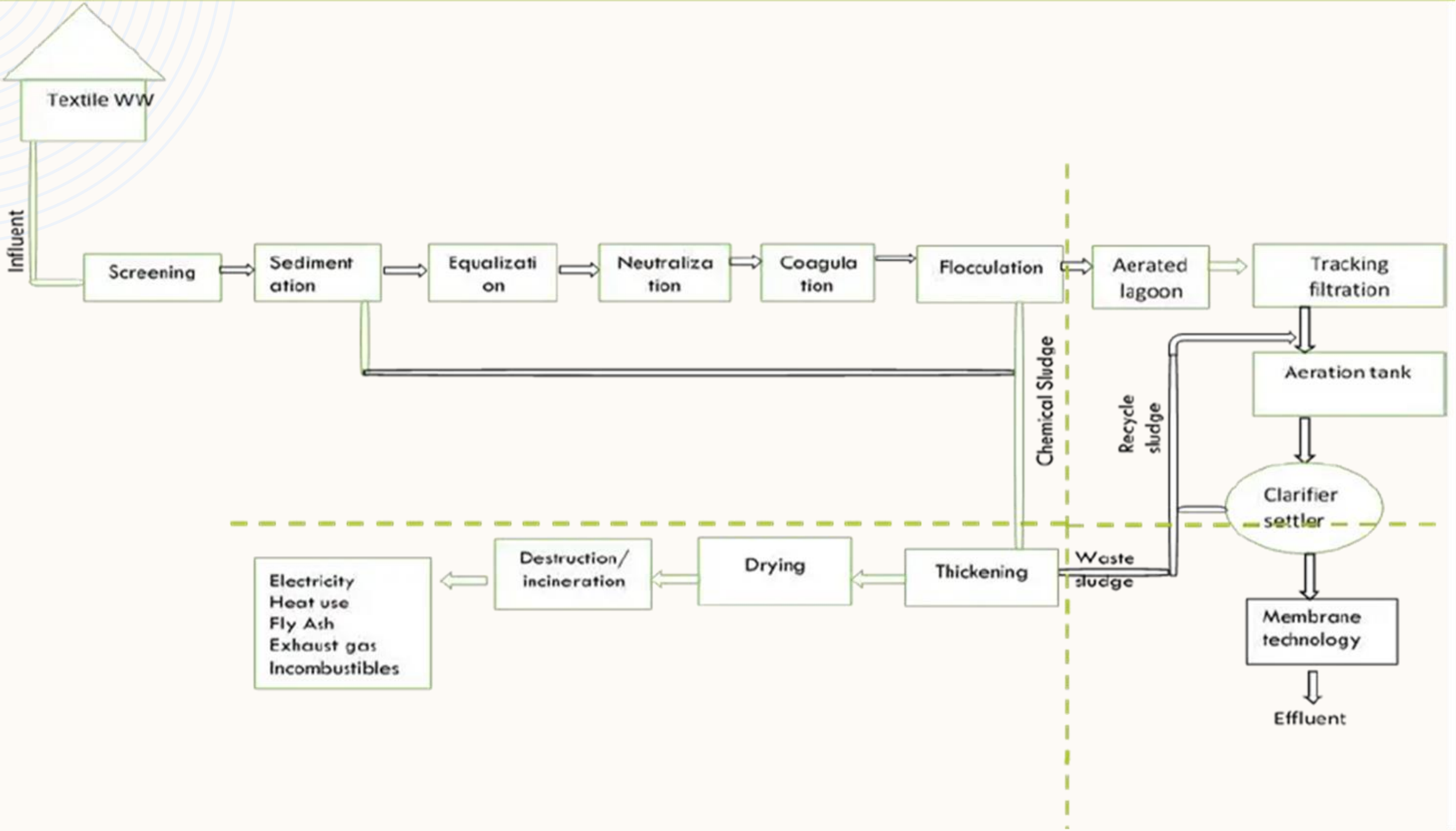
Chemical process	Pollutants in waste water	Nature of waste water
Desizing	Starches, fats and waxes	High BOD(about 45% of total)
scouring	Caustic soda, waxes, greases, soda ash , sodium silicates, fibrous matter	strongly alkaline, dark brown, high BOD (about 30% of total)
Bleaching	Hypochlorite, chlorine, caustic soda, acids, hydrogen peroxide, sodium silicate	Alkaline, about 4% of total BOD
Mercerizing	Caustic soda	Strongly alkaline , low BOD
Dyeing	Various dyes, auxiliaries, chemicals, soap	Strongly colored with varying hues, about 4% of total BOD
printing	Colors, thickeners, auxiliaries	Highly colored, about 8% of total BOD

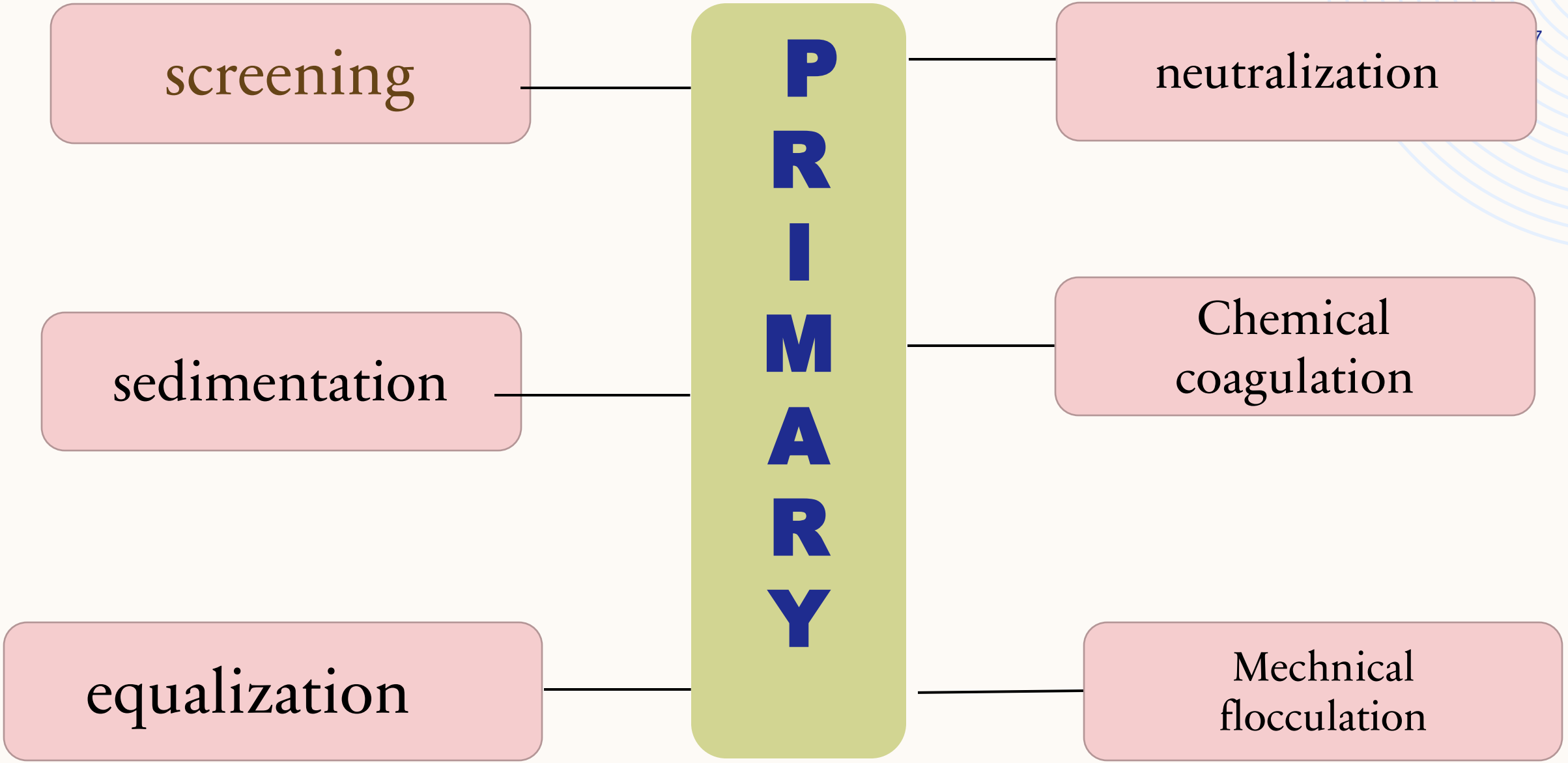
LEVELS OF TREATMENT

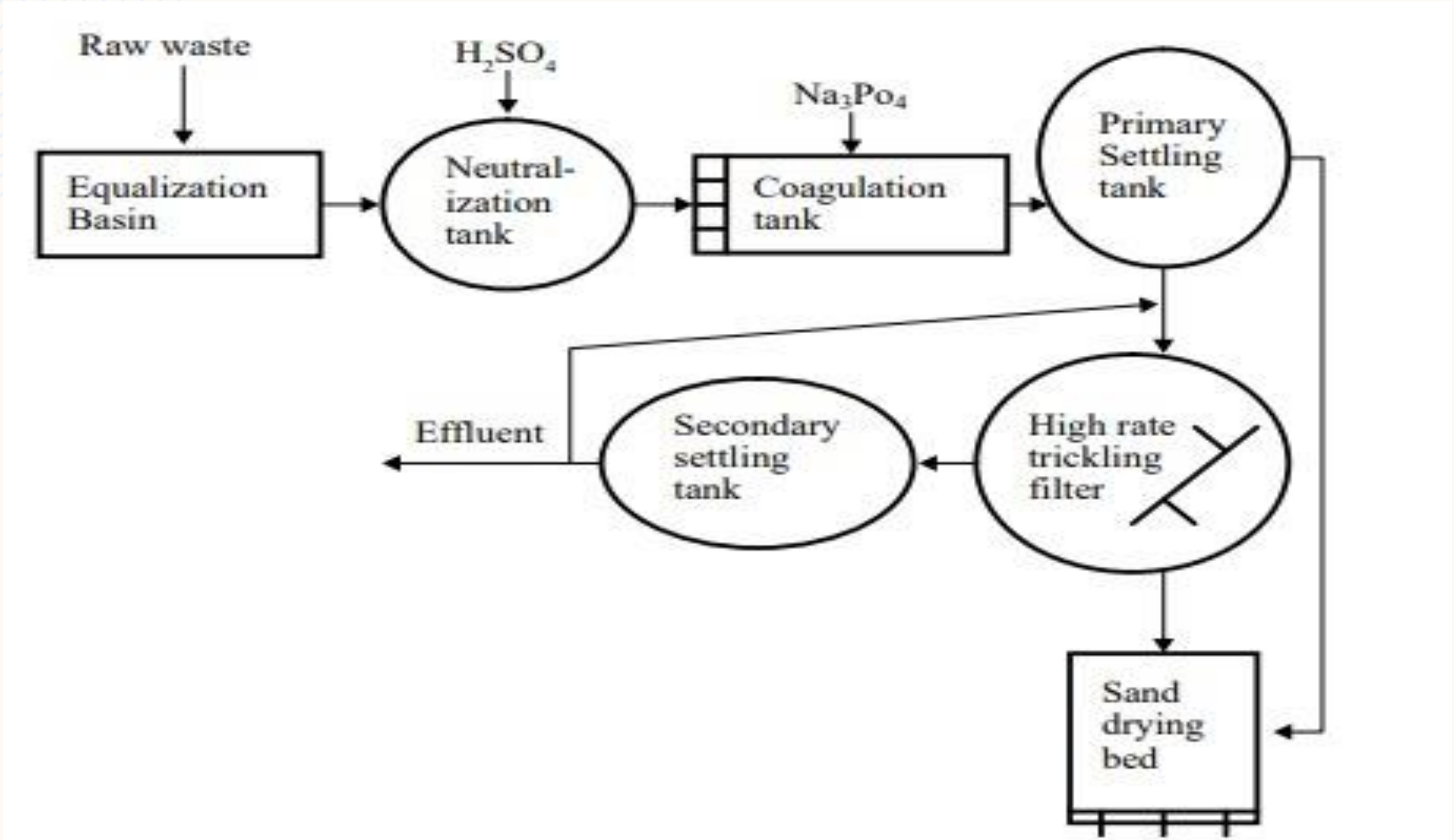
1. PRIMARY

2. SECONDARY

3.TERTIARY


Textile WW
Influent
Screening
Sediment ation
Equalizati on
Neutraliza tion
Coagula tion
Flocculation
Aerated lagoon
Tracking filtration
Aeration tank
Clarifier settler
Membrane technology
Effluent
Chemical Sludge
Recycle sludge
Waste sludge
Thickening
Drying
Destruction/ incineration
Electricity
Heat use
Fly Ash
Exhaust gas
Incombustibles


screening
sedimentation
equalization
PRIMARY
neutralization
Chemical coagulation
Mechnical flocculation


Raw waste
H_2SO_4
Na_3Po_4
Equalization Basin
Neutral-ization tank
Coagulation tank
Primary Settling tank
Effluent
Secondary settling tank
High rate trickling filter
Sand drying bed

SCREENING

- Coarse suspended matters such as rags , pieces of fabric, fibres, yarns & lint are removed.
- Bar screens & mechanically cleaned screens remove most of the fibres

SEDIMENTATION

- useful for treatment of wastes containing high % of settable solids
- The settled sludge is removed from the sedimentation tanks by mechanical scrapping into hoppers and pumping it out subsequently.

EQUALIZATION

- Effluents streams are collected into 'slump pit'.
- Sometimes mixed effluents are stirred by rotating agitators or by blowing compressed air from below.
- The pit has a conical bottom for enhancing the settling of solid particles.

NEUTRALIZATION

- Normally, ph values of cotton finishing effluents are on alkaline side. Hence , ph value of equalized effluent should be adjusted.
- By the use of diluted sulphuric acid.

CHEMICAL & MECHANICAL FLOCCULATION

- Finely divided suspended solids & colloidal particles can't be efficiently removed by simple sedimentation . In such cases, this method is employed.
- In mechanical flocculation, the textile waste water is passed through a tank under gentle stirring; the finely divided suspended solids coalesce into larger particles and settle out.
- Specialized equipment such as clari-flocculator is also available, wherein flocculation chamber is a part of a sedimentation tank.

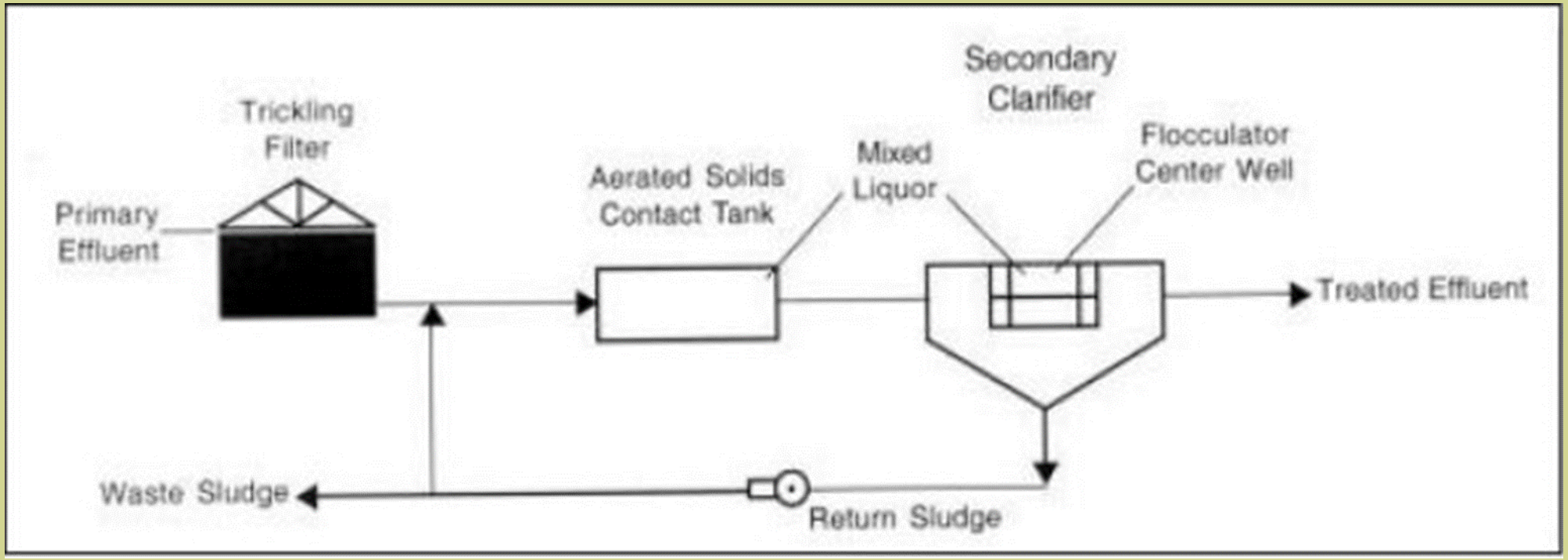
SECONDARY TREATMENT

AERATED LAGOON

TRICKLING FILTRATION

ACTIVATED SLUDGE PROCESS

OXIDATION DITCH/POND



AERATED LAGOON

it is a holding and/or treatment pond provided with artificial aeration to promote the biological oxidation of wastewaters.

TYPES OF AERATED LAGOONS

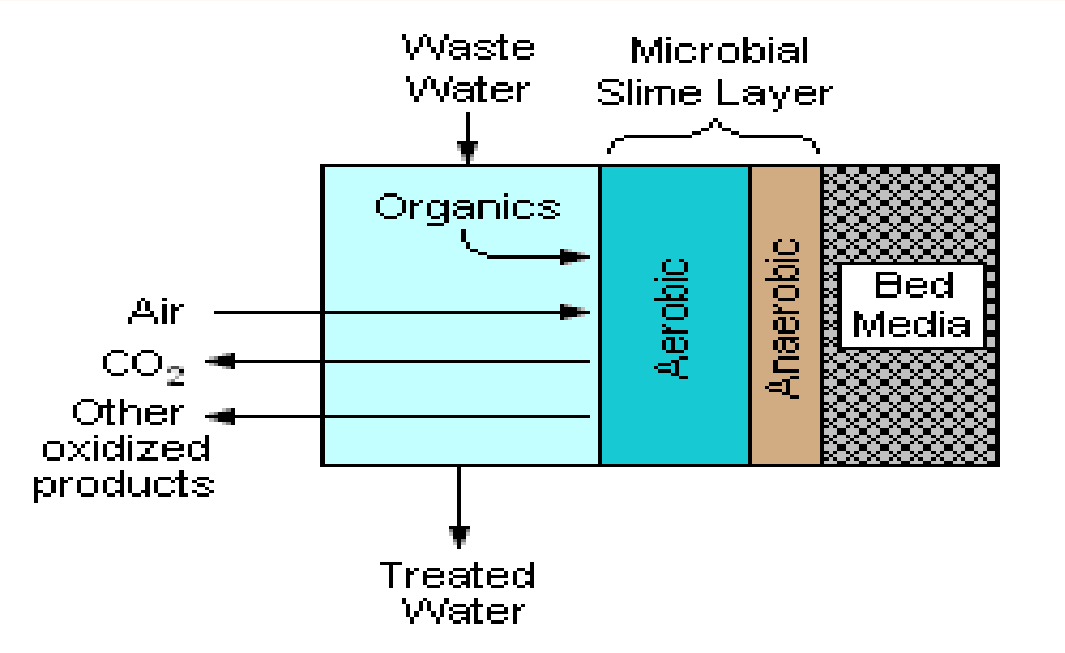
- Suspension mixed lagoons, where there is less energy provided by the aeration equipment to keep the sludge in suspension.
- Facultative lagoons, where there is insufficient energy provided by the aeration equipment to keep the sludge in suspension and solids settle to the lagoon floor.

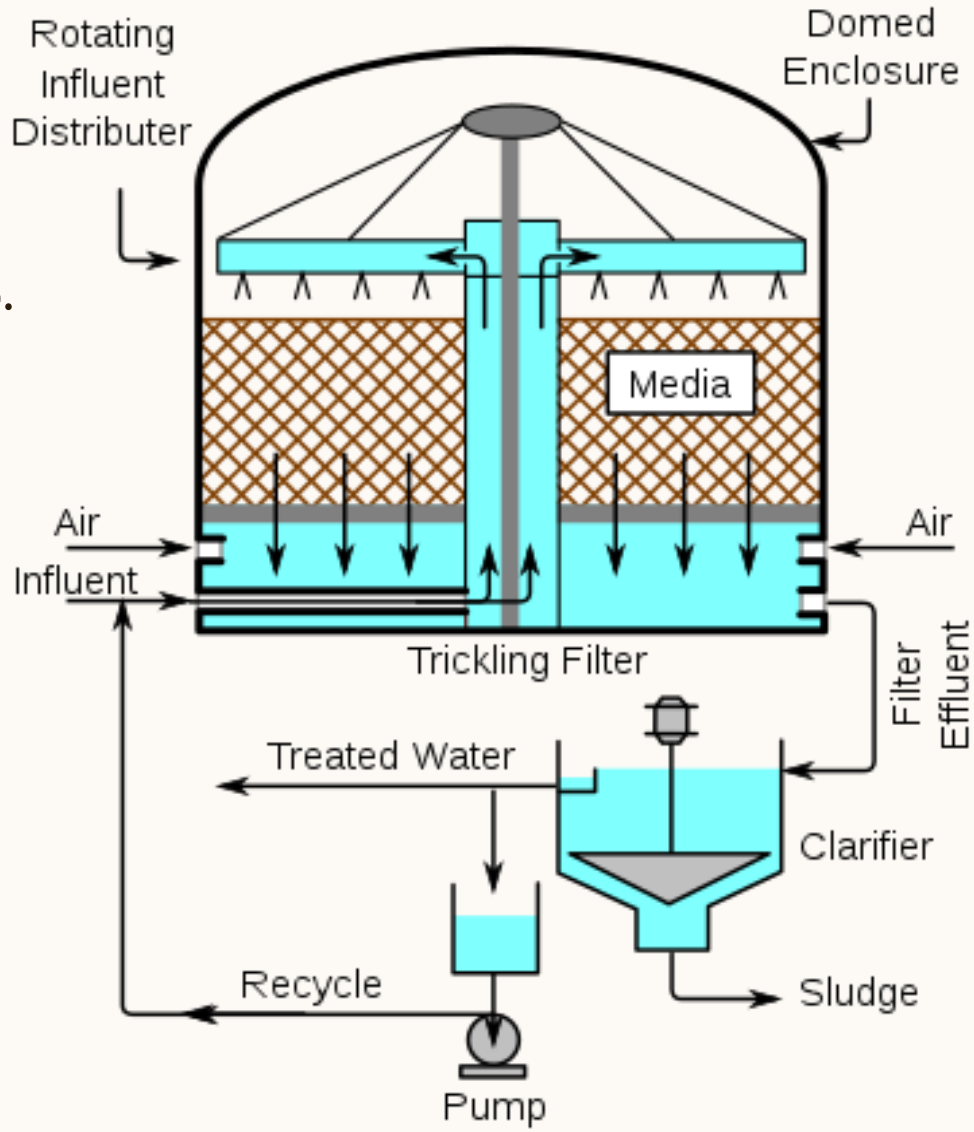
The biodegradable solids in the settled sludge then degrade as in an anaerobic lagoon.

TRICKLING FILTER

It consists of a bed of coal, gravel, Poly Vinyl Chloride (PVC), broken stones or synthetic resins of a highly permeable medium to which microorganisms are attached and through which wastewater is percolated or trickled downward and causes a layer of microbial slime (biofilm) to grow, covering the bed of media.

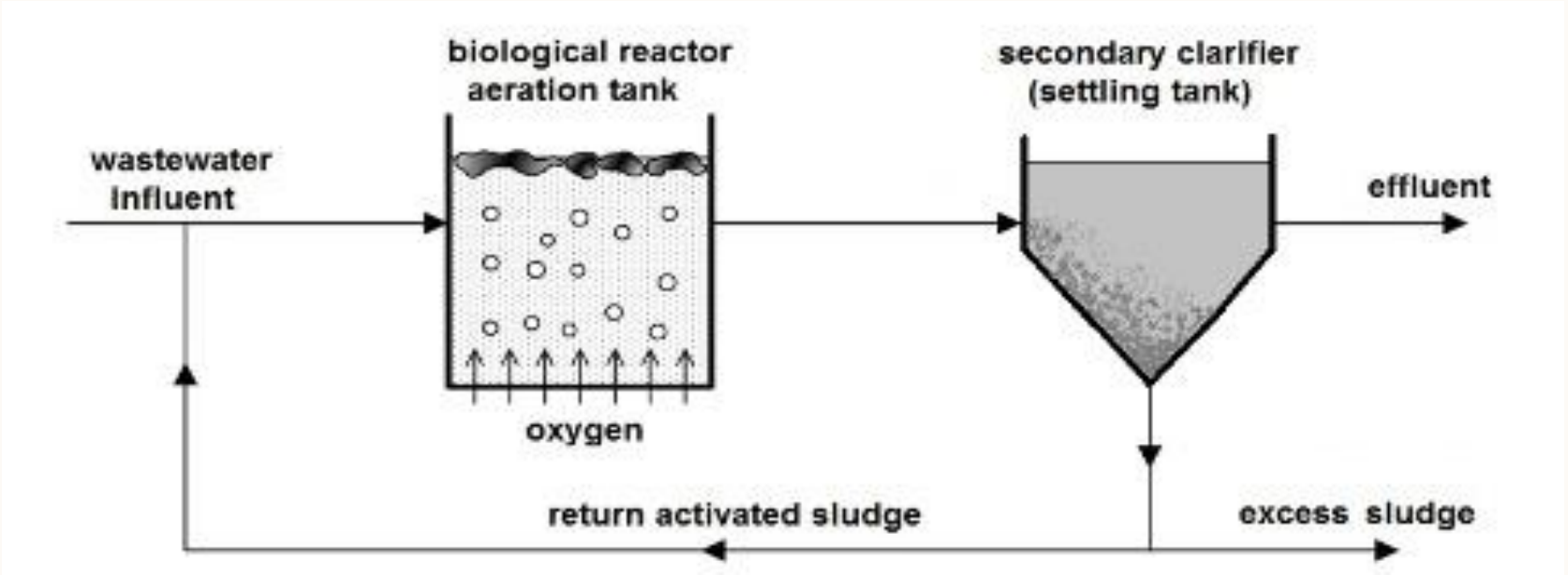
- This easiest step of reducing the BOD5 between 50 and 70%.





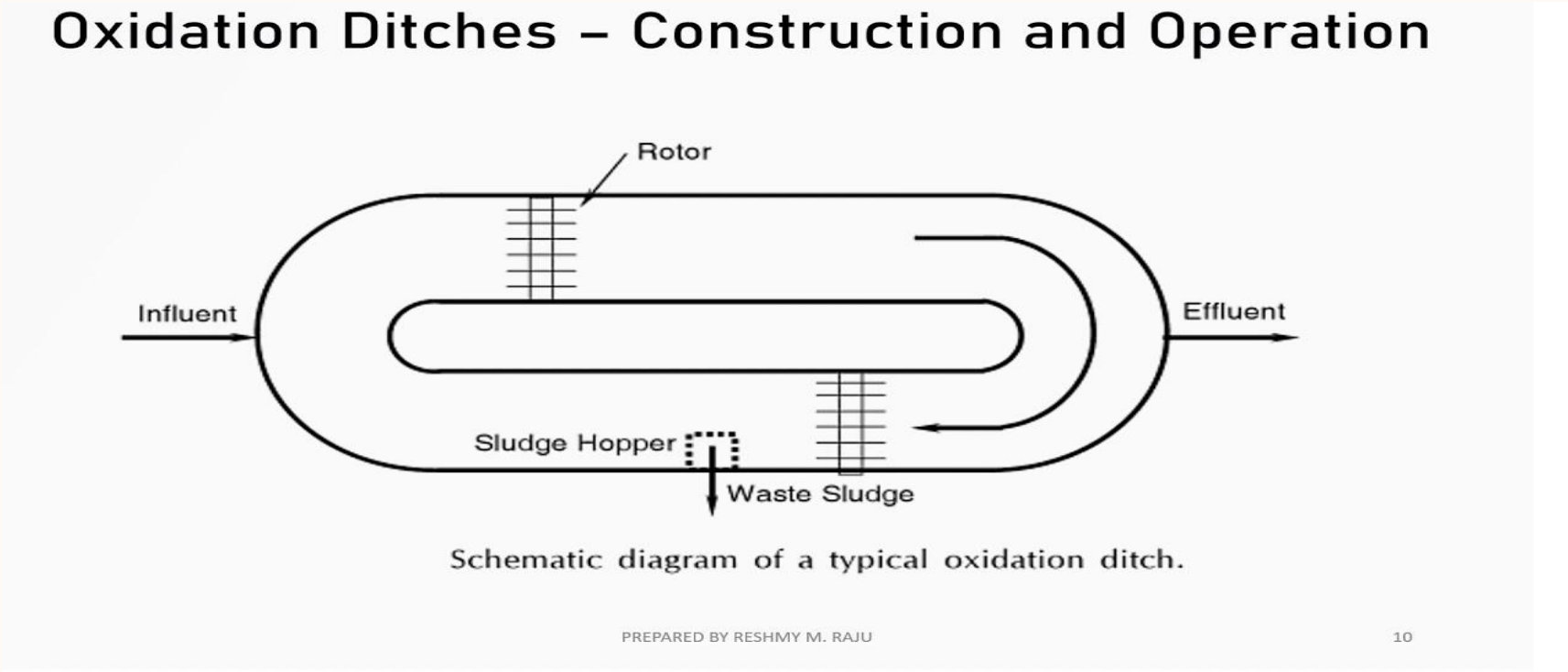
ACTIVATED SLUDGE

- The activated sludge process is a process for treating sewage and industrial wastewaters using air and a biological floc composed of bacteria and protozoa. It uses air (or oxygen) and microorganisms to biologically oxidize organic pollutants, producing a waste sludge (or floc) containing the oxidized material.
- Oxidizing carbonaceous biological matter, oxidizing nitrogenous matter: mainly ammonium and nitrogen in biological matter, removing nutrients (nitrogen and phosphorus).
- It involves a regular aeration of the effluent inside a tank allowing the aerobic bacteria to metabolize the soluble and suspended organic matters. A part of the organic matter is oxidized into CO_2 and the rest are synthesized into new microbial cells

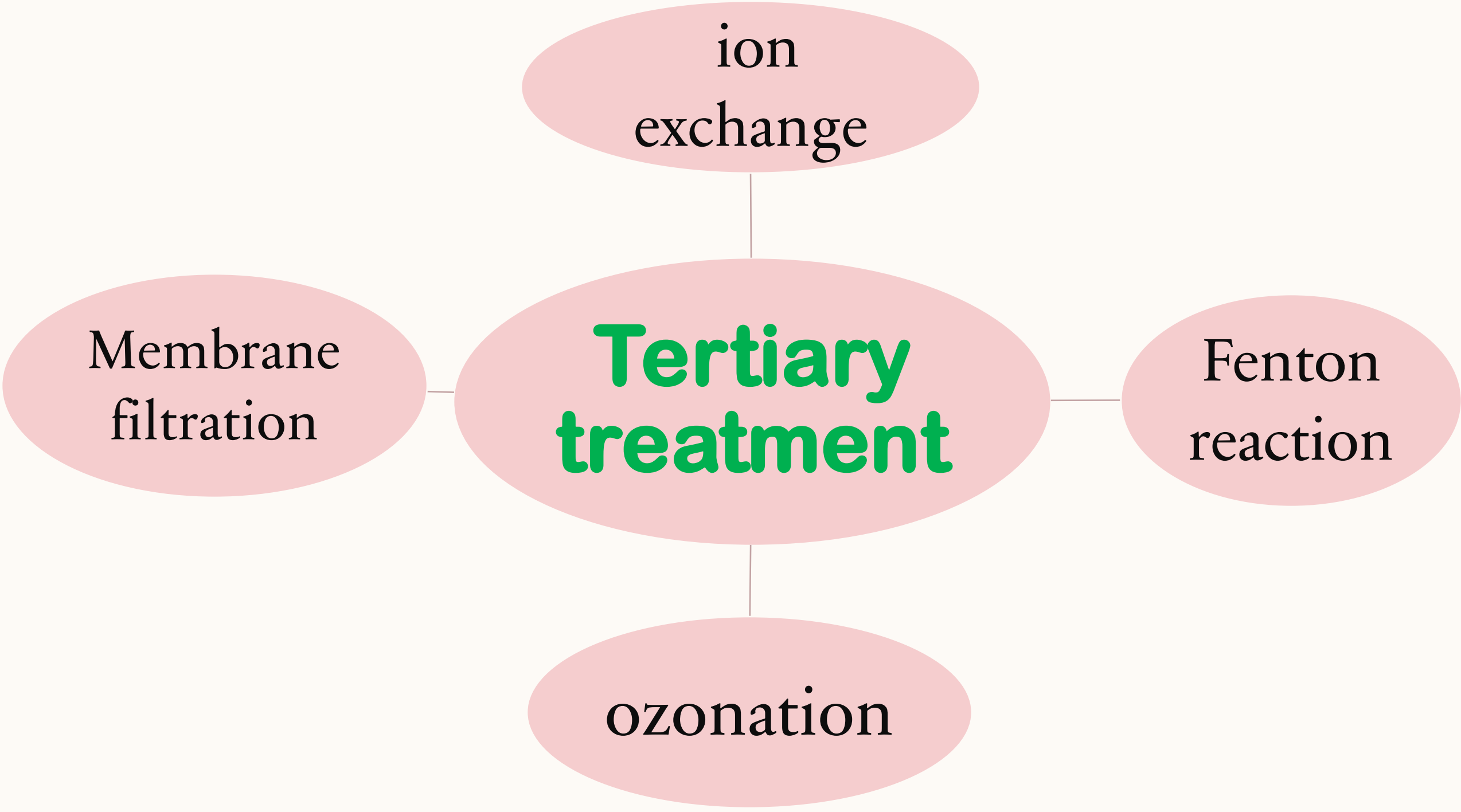


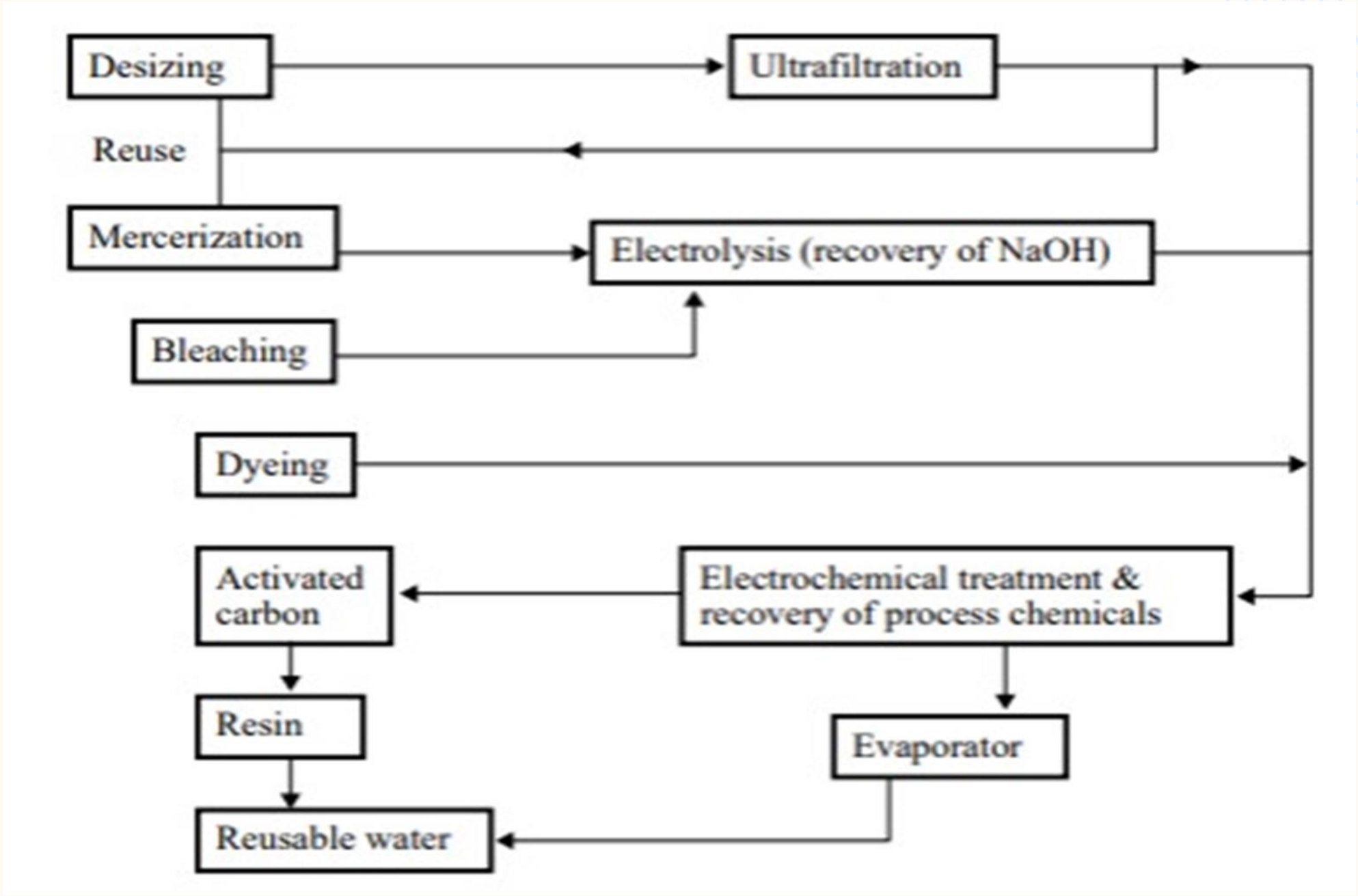
OXIDATION DITCH

- oxidation ponds are large, shallow ponds that are designed to treat wastewater through the interaction of sunlight, bacteria, and algae.
- oxidation ditch is a modified activated sludge that involves biological treatment processes utilizing long solids retention times for the removal of biodegradable organics.
- The Oxidation Ditch is a highly efficient aeration system using very low speed surface aerators.
- Aerators are mounted at watercourse channels in a racetrack configuration to provide complex mixing in the aeration zones.
- FeSO4 solution was added into it to carry out chemical reaction



Schematic diagram of a typical oxidation ditch.


ion exchange
Membrane filtration
Tertiary treatment
Fenton reaction
ozonation


Desizing
Ultrafiltration
Reuse
Mercerization
Electrolysis (recovery of NaOH)
Bleaching
Dyeing
Activated carbon
Electrochemical treatment & recovery of process chemicals
Resin
Evaporator
Reusable water

FENTON REACTION

- Fenton's reagent is a solution of hydrogen peroxide and an iron catalyst that is used to oxidize contaminants or waste waters. Fenton's reagent can be used to destroy organic compounds.

OZONATION

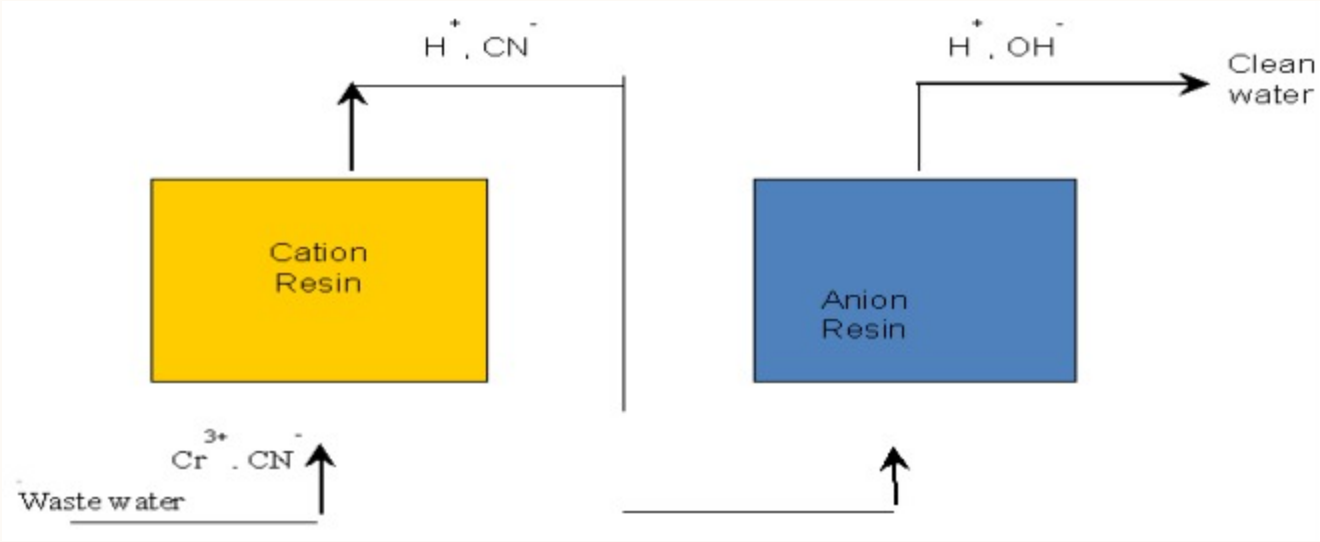
- Very effective and fast decolourising treatment. Can easily break the doublebonds present in most of the dyes. Inhibit or destroy the foaming properties of residual surfactants. It can oxidise a significant portion of cod.

ADSORPTION

- Used to removes colour and other soluble organic pollutants from effluent The process also removes toxic chemicals such as pesticides, phenols, cyanides and organic. Most commonly used adsorbent for treatment is activated carbon

ION EXCHANGE

- Ion exchange process is normally used for the removal of inorganic salts
- salts are composed of a +ve ion of a base and a -ve ion of an acid.
- IE materials are capable of exchanging soluble ions and cations with electrolyte solutions.
- e,g a cation exchanger in the Na form when contacted with a sol of cacl2 will scavenge the Ca ions from the solution and replace them with Na ions.
- This is a convenient method for removing the hardness from water or effluent.

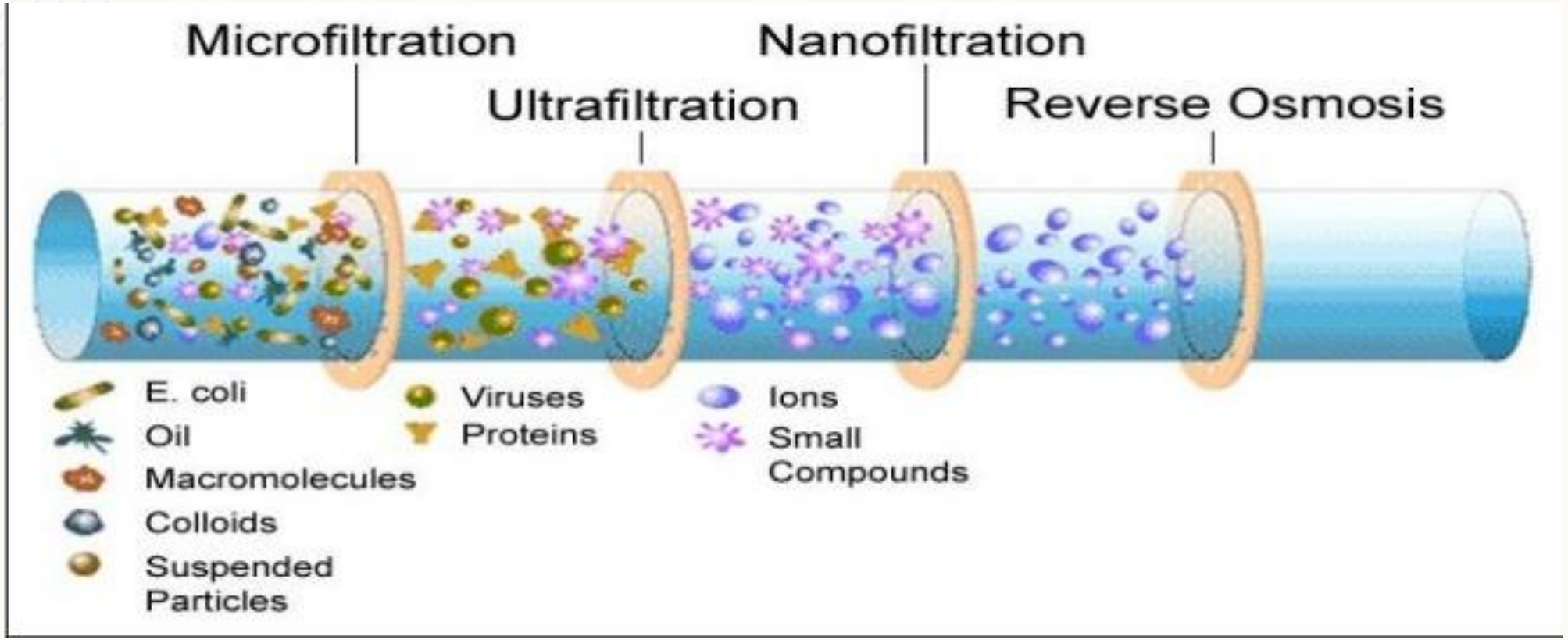


MEMBRANE TECHNOLOGY

the method that uses the membrane's microspores to filter and makes use of membrane's selective permeability to separate certain substances in wastewater.

Ultra-filtration (UF) membranes retain only macro molecules and suspended solids

- Thus salts, solvents and low molecular weight organic solutes pass through UF membrane with the permeate water.
- **Nano-filtration (Nf)** It is capable of removing hardness elements such as calcium or magnesium together with bacteria, viruses, and colour, applied for the treatment of colored effluents from the textile industry
- **Reverse osmosis** - technique which makes use of membranes that have the ability to remove total dissolved solid contents along with ions and larger species from the effluents., microfiltration


Microfiltration
Ultrafiltration
Nanofiltration
Reverse Osmosis
E. coli
Oil
Macromolecules
Colloids
Suspended Particles
Viruses
Proteins
Ions
Small Compounds

THANK YOU