

UNIT OPERATIONS AND PROCESSES:

Waste water treatment is any operation / process or combinations of operations and processes that can reduce the objectionable properties of waste water and render it less dangerous. Waste water treatment is a combination of physical, chemical and biological processes.

Methods of treatment in which application of physical forces predominate, are known as unit operations.

Methods of treatment in which chemical or biological activities are involved, known as unit processes.

The unit operations approach in water and waste water treatment has following advantages:

1. Gives better understanding of the processes and the capabilities of these processes in attaining the objectives.
2. Helps in developing mathematical and physical models of treatment mechanisms and the consequent design of treatment plants.
3. Helps in coordination of effective treatment procedure to attain the desired plant performance.

PHYSICAL UNIT OPERATIONS

OPERATION	APPLICATION
1. Screening	Removal of coarse and settleable solids by surface straining
2. Comminution	Grinding of coarse solids
3. Flow Equalisation	Equalisation of flow and mass loadings of BOD suspended solids.
4. Mixing	Mixing of chemicals and gases with waste water and maintaining solids in suspension

5. Flocculation	Promotion of aggregation of smaller particles into larger ones.
6. Sedimentation	Removal of settleable solids and thickening of sludge.
7. Floatation	Removal of finely divided suspended solids and particles. Also thickens biological sludge.
8. Filtration	Removal of fine residual suspended solids remaining after biological or chemical treatment.
9. Micro screening	Same as filtration. Also removal of algae from stabilization pond effluents

CHEMICAL UNIT PROCESSES

PROCESS	APPLICATION
1. Chemical Precipitation	Removal of phosphorous and enhancement of suspended solids removal in primary sedimentation
2. Gas Transfer	Addition and removal of gases
3. Adsorption	Removal of organics
4. Disinfection	Disinfection of disease causing organisms
5. De chlorination	Removal of total combined chlorine residuals
6. Miscellaneous	Achievement of specific objectives in waste water treatment

BIOLOGICAL UNIT PROCESSES

Biological unit processes are those in which removal of contaminants are brought about by biological activity. In biological treatment of waste water, the objectives are to

coagulate and remove the non settleable colloidal solids and to stabilize the organic matter. The waste water is generally from three sources

(i) domestic waste water (ii) agricultural return waste water (iii) industrial waste water

For domestic waste water, the objectives are to remove various nutrients, specifically nitrogen and phosphorous, which are otherwise capable of stimulating growth of aquatic plants.

Biological processes are classified by the oxygen dependence of the primary microorganisms responsible for waste treatment.

Aerobic processes:

Biological treatment process that occurs in the presence of dissolved oxygen. The bacteria that can survive in the presence of DO are known as obligate aerobes. The aerobic process include the following:

1. Activated sludge process
2. Trickling filters

Anaerobic processes: Involves the decomposition of organic or inorganic matter in the absence of molecular oxygen

