



Advanced Technologies
Industrial Treatment

Conventional
And
Un-Conventional



Industrial wastewater treatment

- covers the mechanisms and processes used to treat waters that have been contaminated in some way by man's industrial or commercial activities prior to its release into the environment or its re-use.



Solids removal

- Most solids can be removed using simple sedimentation techniques with the solids recovered as slurry or sludge. Very fine solids and solids with densities close to the density of water pose special problems. In such case filtration or ultra-filtration may be required. Alternatively, flocculation may be used using alum salts or the addition of poly-electrolytes

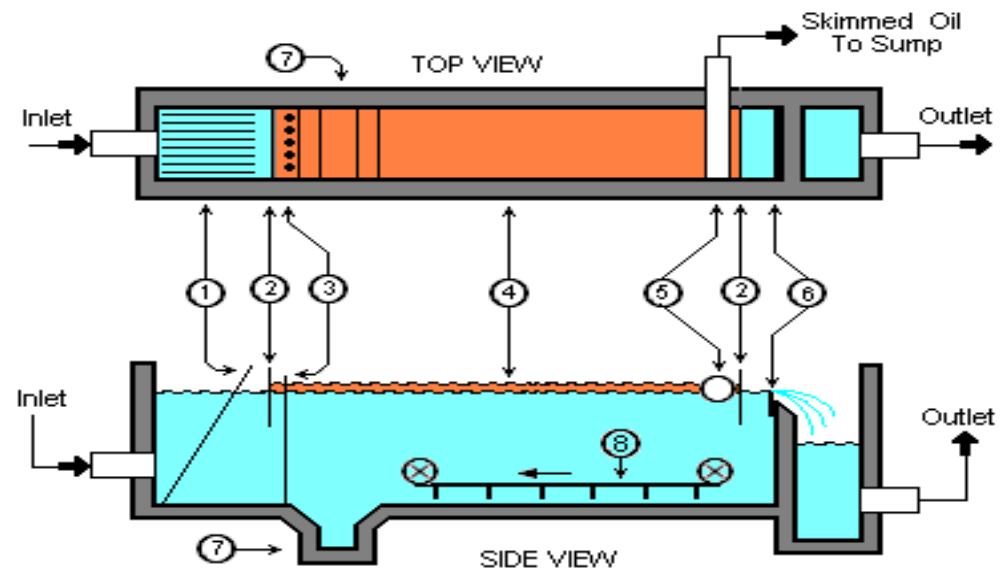
Oils and grease removal



- A typical oil-water separator used in many industries
- Many oils can be recovered from open water surfaces by skimming devices. However, hydraulic oils and the majority of oils that have degraded to any extent will also have a soluble or emulsified component that will require further treatment to eliminate. Dissolving or emulsifying oil using surfactants or solvents usually exacerbates the problem rather than solving it, producing a very difficult to treat wastewater.

Oil Skimmer

Oil Skimmer



- 1 Trash trap (inclined rods)
- 2 Oil retention baffles
- 3 Flow distributors (vertical rods)
- 4 Oil layer
- 5 Slotted pipe skimmer
- 6 Adjustable overflow weir
- 7 Sludge sump
- 8 Chain and flight scraper



Removal of biodegradable organics

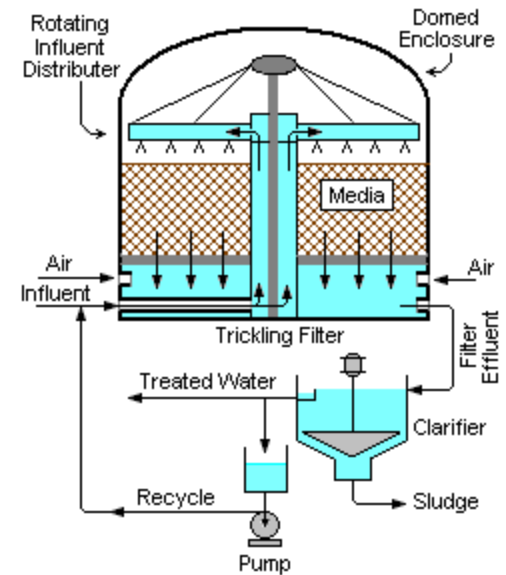
- Biodegradable organic material of plant or animal origin is usually possible to treat using extended conventional wastewater treatment processes such as activated sludge or trickling filter.



A trickling filter

- A **trickling filter** consists of a bed of rocks, gravel, slag, peat moss, or plastic media over which wastewater flows downward and contacts a layer (or film) of microbial slime covering the bed media. Aerobic conditions are maintained by forced air flowing through the bed or by natural convection of air. The process involves adsorption of organic compounds in the wastewater by the microbial slime layer, diffusion of air into the slime layer to provide the oxygen required for the biochemical oxidation of the organic compounds. The end products include carbon dioxide gas, water and other products of the oxidation. As the slime layer thickens, it becomes difficult for the air to penetrate the layer and an inner anaerobic layer is formed.

- Trickling filter



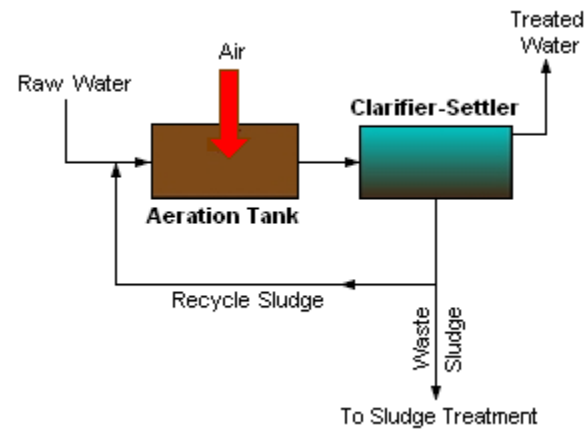


Activated sludge

- Activated sludge is a biochemical process for treating sewage and industrial wastewater that uses air (or oxygen) and microorganisms to biologically oxidize organic pollutants, producing a waste sludge (or floc) containing the oxidized material. In general, an activated sludge process includes:
 - An aeration tank where air (or oxygen) is injected and thoroughly mixed into the wastewater.
 - A settling tank (usually referred to as a "clarifier" or "settler") to allow the waste sludge to settle. Part of the waste sludge is recycled to the aeration tank and the remaining waste sludge is removed for further treatment and ultimate disposal.



■ Activated Sludge





Ion Exchange

- **Ion Exchange** with synthetic resins and adsorption into activated alumina are water treatment processes in which a pre-saturant ion on the solid phase, the adsorbent" is exchanged for unwanted ion in the water.
- Source water is passed through a packed bed of ion exchange resin beads or alumina granules are used.
- This technology is used to remove contaminant cations such as calcium, magnesium, barium, radium, and anions such as fluoride, nitrate, arsenate, chromate, and anion complexes of uranium can be removed from water by using ion exchange method.
- Main uses are for softening water and purifying drinking water. Efficient for house uses and municipal water. For large scale use reverse osmosis.



Reverse Osmosis

- **Reverse osmosis** (RO) is a separation process that uses pressure to force a solvent through a membrane that retains the solute on one side and allows the pure solvent to pass to the other side. More formally, it is the process of forcing a solvent from a region of high solute concentration through a membrane to a region of low solute concentration by applying a pressure in excess of the osmotic pressure. This



Reverse Osmosis

- Mainly used for Sea water desalting
- Water Salinity: could reach a salinity of 6000 ppm (mg/l)
- Reverse Osmosis system design incorporates the updated membrane technology of spiral wound (thin film composite) membranes and hollow-fine fibre type membrane, where salt rejection reaches 99.8%.
- RO Capacity: can achieve above 2000 m³ /hr
- PROCESS: The raw water is drawn from raw water tank using filter feed pumps to feed the water into the dual media sand filter. Before the filters, the raw water is injected with Sodium Hypochlorite to kill any bacteria present in the water before entering the Reverse Osmosis Unit.



Cont. Reverse Osmosis

- Also, the water is being injected with the following chemicals:
 1. Sodium Metabisulphate
 2. Sulphuric acid
 3. Anti-scalant
- Sodium Metabisulphite is a dechlorination process to get rid of all traces of chlorine in the water to protect the membrane fibres.
- The water is then pressurized by the high-pressure pump up to 26-28 bar depending on design conditions going into the membranes, where water is then separated into permeate (product) and the reject (waste) streams.
- The product water from all membranes is collected in one manifold and then pumped to the product water tank. Before entering the product water tank, the water is being pH corrected (adjusted) and sterilised using the Chlorination system.