

## **Introduction:**

Most of Sewage Treatment Plants and Effluent Treatment Plants are installed with conventional activated sludge process as biological treatment unit. However, there are other modified or updated version of biological treatment available in market, since past few years. It is worth to be noted that each of these technologies have their own pros and cons, but the technology can be selected based on technological and financial evaluation for a specific project.

## **Technologies in Brief:**

Biological treatment process is a process where microorganisms are used to treat the wastewater and reduce pollution load. Microorganism use organic material present in the wastewater as food and grow to have a floc of microbes or a biofilm on a supporting media.

## **Components/ Processes involved in Each Technologies:**

Based on the applicable technology following major type of processes used in biological treatment

- Conventional activated sludge process
- Sequential Batch Reactor
- Moving Bed Bio Reactor
- Membrane Bio Reactor

## **Brief Description of each component /process:**

- Conventional activated sludge process:

Process in Brief: Biomass is developed in aeration tank, where air is continuously applied through blower or surface aerator. Wastewater is fed to aeration tank and flow into settling tank known as clarifier, here biomass is allowed to settle and separates from wastewater. Clear water flows outside of clarifier and settled sludge recycled back into aeration tank, known as activated biomass.

- Major highlights:
  - o Require more land area compared to other technologies
  - o Operates on continuous basis
  - o Simple operation
  - o Cost effective

### - Sequential Batch Reactor

Process in Brief: Biomass is developed in SBR tanks- generally operates in dual tank mode, where air is applied through blowers. Operation type is having four stages – Fill, aeration, settling and decantation. Wastewater is filled in tank, aeration is started for a specified period once filled to full level, then aeration stops and allow settling of biomass within tank itself. Once biomass is settled clear supernatant wastewater is decanted and discharged from the system.

#### - Major highlights:

- o Contains anoxic zone which provide control over denitrification
- o Better operation control as operates in batch mode
- o Better space management
- o Require automation
- o Cost is higher than conventional treatment process
- o Require two tanks of same size to operate on continuous basis

### - Moving Bed Bio Reactor

Process in Brief: Biomass is developed on supporting media as biofilms. These media are continuously kept in suspended form by blowing air through blowers. The biofilms developed on supporting media, degrades the pollution load present in wastewater. Generally provided with a settler to separate biomass mixed with wastewater. Clear supernatant of the clarifier – settler is discharged from the system.

#### - Major highlights:

- o Provide good removal of pollution load.
- o Need continuous monitoring of media is required.
- o Particularly useful for packaged installation
- o Installation Circular tanks are convenient
- o More height can be kept for reactor
- o Media replacement and checking is little cumbersome.

### - Membrane Bio Reactor

Process in Brief: Biomass is developed in aeration basin by providing air and nutrients. The mixed liquor is then filtered through battery of membranes either submerged (internal) or side-stream (external). By providing high force of pumps, mixed liquor is

## Comparing Technologies – Conventional ASP, SBR, MBBR, MBR

filtered and clear filtrated is released from system, while solid part (i.e biomass) is transferred back to aeration basin.

Major highlights:

- Mostly runs at higher MLSS level
- Can accept high pollution load as compare to other process
- Compact size due to use membranes and avoiding separate settler
- Does not require tertiary and disinfectant treatment in most cases
- Remarkably high capital cost
- High operation cost
- Sophisticated controlling system required
- Very few players in the market who produce membranes for this application

### Reference:

- Manual on Sewerage and Sewage Treatment Systems, Central Public Health & Environmental Engineering Organization (CPHEEO), Ministry of Housing and Urban Affairs, Government of India
- US Environmental Protection Agency