

Sanitation Technology Information Sheet

CONVENTIONAL SEWAGE TREATMENT SYSTEMS

Sewage from households and buildings such as offices, hotels, restaurants, and hospitals is a major source of pollution and disease-causing bacteria when not collected and treated properly. This info sheet describes various options for treating sewage either at the source or collected from several sources using pipes or the drainage system.

Conventional sewage treatment systems (sometimes referred to as mechanical systems) are used where space is very limited. Because they are mechanized, they are more expensive to build and operate compared to natural treatment systems that require more space, such as lagoons.

Common Technologies

While there are many types of conventional sewage treatment systems, four of the most common systems are presented below. Each of the following systems can treat sewage to meet government discharge regulations in South and Southeast Asia.

1. Activated sludge
2. Sequencing batch reactor
3. Trickling filter
4. Rotating biological contactor

I. Activated Sludge



Activated sludge plant, Philippines

First developed in England in the early 1900s, activated sludge has commonly been used worldwide to treat large volumes of wastewater. By definition, activated sludge refers to “the active population of micro-organisms that are used to treat wastewater.”

Through a series of controls, pumps, and tanks, the sewage undergoes various processes in separate basins or tanks; these processes include: primary settling, aerobic biological treatment, secondary settling, disinfection, and discharge.

2. Sequencing Batch Reactor

The sequencing batch reactor (SBR) is a “fill and draw” variation on the activated sludge process. Instead of using separate tanks for each process, the entire treatment process occurs in one tank.

The SBR processes are:

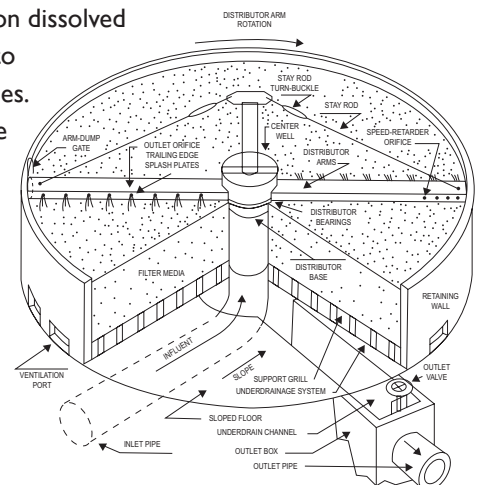
- *Fill* – the tank is filled with wastewater;
- *React* – the wastewater is aerated and mixed with biomass that has been acclimated to the wastewater environment in previous cycles;
- *Settle* – the aeration is turned off and the reacted wastewater is allowed to settle; and
- *Decant* – the treated and clarified supernatant (water in the upper portions of the tank) is pumped out to be disinfected and then discharged.

The benefits of the SBR system include:

- Reducing treatment plant construction costs by minimizing tanks;
- Taking up less space than activated sludge plants; and
- Handling various kinds of wastewater and waste strengths.

The disadvantage of the SBR technology is that it has more complex controls and systems compared to an activated sludge plant. Many SBR systems are computerized and may or may not rely on dissolved oxygen sensors to control cycle times.

While knowledge about these systems is required to effectively operate and maintain SBRs effectively, some controls can be simplified.





3. Trickling Filters

After wastewater passes through a settling tank, it flows through a tank filled with media, such as crushed rock. As the wastewater passes through the media, bacteria living on the media consume the organic material in the wastewater as food.

Trickling filters are simple devices that can operate without electricity. The force of the water is usually all that is necessary to move the distribution arm. A fixed spray device can also distribute the pre-treated wastewater.

Trickling filters are very efficient in treating wastewater. Although they still require primary settling basins, clarifying and disinfection units, they use less energy than activated sludge plants.

Recent innovations in trickling filter technology include advanced media. Traditionally, trickling filter media has been limited to crushed rock between 2 and 5 cm in diameter. New synthetic media maximizes the surface area where bacteria can attach themselves. This can dramatically improve treatment efficiency while reducing the size of the media filter.

4. Rotating Biological Contactor

The rotating biological contactor (RBC) system is a media system similar to the trickling filter; however, the media is on a disc that slowly rotates through the wastewater.



*Kennebunk sewer system,
Maine, USA*

At the center of the RBC is a solid steel shaft connected to a drive unit and small motor. As the disc rotates through the settled sewage, the bacteria living on the media consume the organic material in the wastewater. RBC units can be very effective in treating wastewater. As the disk rotates through the air, oxygen transfer occurs with minimum energy input.



*Chlorine contact basin,
Muntinlupa, Philippines*

When designed properly, RBCs have proven to produce good quality effluent even with highly variable wastes. In addition, they can be designed and installed in phases to since they are modular in nature.

Disinfection

Disinfection is required to kill the pathogens that might remain in the treated wastewater. Chlorine disinfection is the most popular method, although ozone and ultra violet (UV) light are becoming popular. If chlorine is the disinfectant of choice, it must be in contact with the wastewater for a minimum of 15 minutes before the water is discharged into the environment. UV lights and/or ozone generators may be incorporated into treatment systems using specialized equipment.

Sludge Handling

All four processes discussed above generate sludge. Sludge can be digested or dried on-site. Dried sludge may be composted and used as a soil amendment if it does not contain unsafe levels of heavy metals, or it can be placed in a landfill.



Sludge drying beds, Muntinlupa, Philippines