# AEROBIC SEPTIC SYSTEM FOR A RESIDENTIAL APARTMENTS

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**Abstract** - *Aerobic septic treatment is a process used to convert domestic sewage into effluent that can be recycled with minimum impact on the environment, or directly reused. The latter is called water reclamation because treated sewage can be used for other purposes and it can be achieved by aerobic septic tank. An aerobic septic system collects influent from residential apartment similar to a septic tank system, but uses an aerobic process for digestion rather than just the anaerobic process used in septic system. The system consists of sedimentation tank, aeration tank, clarifier and a storage tank.*

**Key words: Aeration process, Higher quality effluent, Pre-treatment stage, Aeration stage, settling stage, disinfecting stage, Sodium hypochlorite (NaOCl).**

## 1. INTRODUCTION

In our country water scarcity will be the major threatening to future generation. This water scarcity can be reduced by reusing the waste water by adopting various waste water treatment systems. When suitable for the site and soil conditions, a traditional septic tank and soil absorption field is the ideal onsite wastewater system choice because of low cost, simplicity, no energy requirement, and low maintenance. Site limitations such as small lot, poor soil, high groundwater, shallow soil depth to rock. Other options include enhanced / advanced treatment, absorption field alternatives like pump-dosed, low pressure pipe or drip dispersal, lagoon, and off-site treatment.

Enhanced or advanced treatment units further treat the wastewater before it is discharged to the soil absorption field for final treatment. These components reduce the total suspended solids (TSS), biochemical oxygen demand (BOD), and stabilize the wastewater, and some also reduce nutrients. Treatment occurs by supplying oxygen to aerobic bacteria, which grow either in suspension or attached to a substrate. These bacteria consume dissolved and suspended organic wastes. Suspended growth is achieved by injecting air into the wastewater to mix and supply oxygen. Attached bacteria grow on a structure wheather submerged, bathed, or dipped in wastewater.

## 2. AEROBIC TREATMENT SYSTEM

An Aerobic treatment system or ATS, often called an aerobic septic system, is a sewage treatment system similar to a septic tank system, but which uses an aerobic process for digestion rather than just the anaerobic process used in septic systems. These systems are commonly found in rural areas where public sewers are not available, and may be used for a single residence or group of homes.

Unlike the traditional septic systems, the aerobic treatment system produces a high quality secondary effluent, which can be treated and used for surface irrigation. This allows much greater flexibility in the placement of the leach field, as well as cutting the required size of the leach field by as much as half.

## 3. PROCESS

**The ATS process generally consists of the following phases:**

1. Pre-treatment stage
2. Aeration stage
3. Settling stage
4. Disinfecting stage

## 4. COMPONENTS AND ITS FUNCTIONS

### 4.1 SEDIMENTATION TANK

The sedimentation tank is built within the unit. It serves as the first stage of treatment where it separates the solids from the liquids to flow into the aeration chamber. The soild particles were deposited in sedimentation tank.

**4.2 AERATION TANK**

Treatment of the sewage occurs in the aeration chamber. Air is bubbled through the sewage by blower (aerator). It allows the natural bacteria to flourish. This bacteria feed on and breakdown the organic material found in sewage.

**4.3 CLARIFIER**

The sewage then flows to the clarifier where the solids are separated from liquid.

**4.4 DISINFECTION AND STORAGE TANK**

After being treated in the aeration tank, the treated effluent is disinfected between the aeration and storage. The most commonly used disinfectant is chlorine. Other disinfectants such as sodium hypochlorite (NaOCl) can be used. The storage tank is used to transport the treated effluent to the surface irrigation by means of sprinkle or spray dispersion.

**4.5 SPRINKLER DISPERSION**

Sprinkler dispersion is a method of applying dispersion water which is similar to rainfall. Water is distributed through a system of pipes usually by pumping. It is then sprayed into the air and dispersed entire soil surface through spray heads so that it breaks up into small water drops which fall to the ground.

Sprinklers provide efficient coverage for small to large areas and are use on all types of properties. It is also adaptable to nearly all soils since sprinklers are available in a wide range of discharge capacity.

Jain sprinkler system is a unique dispersion system. It is designed to ensure maximum water saving, combining high quality, affordability and ease of installation. All the products are made out of high strength & chemical resistance engineering plastics to achieve functional satisfaction and to maintain cost economics.


**FIG.1 Sprinkler**

**4.6 BLOWER**

Proper aeration and blower selection are two important considerations of wastewater treatment. Blowers create air flow (flow rate). The total blower system creates pressure (back pressure) through resistance to air flow. By combining the flow rate and back pressure, you can identify the actual operating air flow. Optimal energy use is achieved when the pressure in headers is just sufficient to overcome the static pressure. The purpose of the blowers is to create additional air flow, and blower controls is to provide the correct air flow at any time, which in turn provides enhanced aeration efficiency. Providing for the correct oxygen level at any moment requires automatic flow adjustments. Blower systems must therefore be most efficient, stable and adaptable to changing conditions. The overall goal is to offer adaptive oxygen supply at an affordable energy cost.

**FIG.2 Blower**

**4.7 ALARM SYSTEM**

Every aerobic treatment system must have an alarm (visible, audible or both) that alerts the owner or operator of a system. This lets the homeowner know if the aerobic treatment unit or storage tank becomes too full or if there is any malfunction with the system. The control box or alarm box should be kept in a place where the owner or operator can be easily alerted.

**5. COMPARISION TO TRADTIONAL SEPTIC SYSTEMS**

The aeration stage and the disinfecting stage are the primary differences from a traditional septic systems; in fact, an aerobic treatment system can be used as a secondary treatment for septic tank effluent. These stages increases the initial cost of the aerobic systems, and also the maintenance requirements over the passive septic system. Unlike many other biofilters, aerobic treatment systems require a constant supply of electric to drive the air pump increasing overall system costs, the disinfectant tablets must be periodically replaced, as well as the electrical components (air compressor) and mechanical components (air diffusers).

On the positive side, an aerobic system produces a higher quality effluent than a septic tank, and thus the leach field can be smaller than that of a conventional septic system, and the output can be discharged in areas too environmentally sensitive for septic system output. Some aerobic systems recycle the effluent through a sprinkler system, using it to water the lawn where regulations approve.

**6. OBJECTIVE AND SCOPE**

1. The main aim of our project is to treat waste water into usable water by aerobic septic system.
2. To reduce the use of fresh water for secondary purposes.
3. To produce higher quality effluent.
4. To balance the water scarcity in future for Irrigation purposes by further treatment.
5. This system can be installed in the individual houses for onsite treatment.

**7. REQUIREMENTS OF AERATION PROCESS**

1. Satisfy the BOD of waste water. (Range : 155-286 mg/l )
2. Satisfy the endogenous respiration of the micro-organism.
3. Maintain minimum dissolved oxygen level of 1 to 3 mg/l throughout the aeration tank.

**8. AIRFLOW EFFICIENCY:**

Proper air supply is critical to various functions in sewage treatment facility:

1. Keeps bacteria suspended.
2. Aids flocculation.

3. Supplies sufficient oxygen transfer for BOD removal and nitrification.

4. The essential function of an aeration control system is to fulfill oxygen demands and maintain the treatment process at the lowest possible costs. A common measurement of proper air flow for the treatment process is to check the DO (Dissolved Oxygen) concentration. Finding the correct level is a key step in optimizing the efficiency of the Aeration System.

## 9. CONCLUSION

This project concludes about the usefulness of aerobic septic tank for the purpose of providing treatment unit in residential apartments. This project also helps to meet the water demand in drought period. The future scope of this project will be high due to the increased demand of water. The project is very effective in providing water for secondary purposes to the selected "HANSA GARDEN RESIDENCY" without any harmful effect. This project contains about the analysis of aerobic septic tank and design calculation of aerobic septic tank. The tank is designed using working stress method for a crack free structure and the water can be safely utilized for secondary purposes. The design period of the project is about 20 years depending upon the usage. And periodical maintenance is also needed for proper working of the aerobic septic tank. An alarm consist of sensors is installed that automatically notifies when the tank is about to overflow. When all requirements are met, an aerated septic tank can be provided in an effective manner to decrease the utilization of fresh water for secondary purposes.

## 10. REFERENCE

1. "pipeline" winter 1996 vol. 7, no. 1- journal proposed by NSF (National Science Foundation).

2. Journal of pharmacognosy and photochemistry- Vol. 4, Issue 4 (2015).

3. Environmental Engineering (vol. 2) - Sewage Disposal And Air pollution Engineering by SANTOSH KUMAR GARG.

4. "Manual on water supply and treatment "published by CENTRAL PUBLIC HEALTH AND ENVIRONMMENTAL ORGANAISATION.