

ASCO₂R PROCESS & DESIGN GUIDELINES

EXTENDED AERATION / CONVENTIONAL ACTIVATED SLUDGE BASIC TREATMENT UNIT PROCESS DESCRIPTION

The standard ASCO₂R sewage treatment plant utilizes the activated sludge method of biological waste reduction.

Activated Sludge plants are characterized by the introduction of raw wastewater directly into the aeration tank, long term aeration (usually 24 hrs.), high mixed liquor suspended solids, high sludge return ration, and low sludge wastage. This system is generally used to serve populations that produce up to 750,000 gallons per day of domestic sewage. Applications include subdivisions, multiple family dwellings, mobile home parks, shopping centers, commercial offices, industrial facilities, motels, schools, and recreation areas.

The long detention time in the aeration tank permits the plant to operate effectively even though flows and strengths vary widely. The standard basic plant can be divided into three units of operation:

1. Aeration Tank
2. Clarification Tank
3. Sludge Decanting Tank (aka Sludge Holding)

Aeration Tank:

The raw wastewater passes through a bar screen before entering the aeration tank. The bar screen prohibits large items from entering the tank that would not readily decompose and possibly plug the airlift pumps. The aeration tank is used for the detention and mixing of raw wastes with sludge the pumped from the clarifier hopper back to the inlet microorganisms present in the return sludge. The air keeps the contents mixed and the solids in continuous contact with the decomposing bacteria. The bacteria absorb the organic material, using it as food. The resulting residue is a stable humus material.

Clarification Tank:

The liquid and solids flow from the aeration tank into the clarifier. The clarifier is a quiescent zone, which allows the solids (sludge floc) to settle to the bottom where they are recirculated to the aeration tank. Small particles of buoyant material may rise to the surface where they are removed by a scum skimmer and pumped to the aeration tank for further detention and decomposition. The effluent from the clarifier is a clear liquid with approximately 90% removal of the suspended solids and organic material.

Sludge Decanting Tank:

This aerated tank is used for storage of excess solids wasted from the treatment plant proper. A portion of the sludge removed from the clarifier is discharged into the holding tank instead of returning it to the aeration tank and to further concentrate the sludge tank contents. The sludge is aerated and then manually discharged to sludge drying beds or disposed of in sanitary land fill.



ASCO₂R

EFFLUENT QUALITY CAPABILITIES

The ASCO₂R Series Sewage Treatment Plant is the newest generation of activated sludge sewage treatment plants, and has been available for over 35 years with over 15,000 units in operation throughout the world.

Basic Unit

The basic standard package treatment plant produces an effluent quality of:

BOD5 = 20 mg/l TSS = 20 mg/l

Basic Unit with Chlorination

The basic unit with disinfection produces an effluent quality of:

**BOD5 = 20 mg/l TSS = 20 mg/l
Fecal Coliform = 200 CFU/100ml**

Basic Unit to Tertiary Level

The basic unit plus the tertiary filter, anoxic tank for nitrate reduction, and any one of the disinfection options will produce an effluent quality of:

**BOD5 = 10 mg/l TSS = 10 mg/l
Fecal Coliform = 2.2 CFU/100ml
Nitrate = 5 mg/l**

All of the above effluent quality levels are subject to:

- (a) the influent level of BOD and TSS not exceeding the design load.
- (b) the proper care and maintenance of the equipment
- (c) the hydraulic loading not exceeding the design load
- (d) the users putting into the system only domestic sewage and nothing that would cause harm to the biological operation or equipment.



1. Aeration tank:

The aeration tank should be sized to provide a minimum of 24 hours detention at design flow.

2. Clarification tank:

- a) Rise rate should not exceed 1,000 gallons per day per square foot of surface area at peak flow rates. A typical peak flow of 2.5 times average daily flow (ADF) would require the rise not to exceed 400 gpdpsf at ADF.
- b) Weir loadings should not exceed 10,000 gallons per day per linear foot.
- c) Hopper walls should be sloped a minimum of 1.7 vertical to 1.0 horizontal.
- d) Return sludge airlift pumps should be a minimum of 3" in diameter with a pumping rate adjustable between 50 and 150% of design flow.
- e) An effective means of scum removal should be provided.
- f) Clarifiers should be sized for a minimum of 4 hours detention at design flow.

3. Diffused air system:

- a) Air should be provided to the aeration tank at a daily minimum rate of 2100 cubic feet per pound of BOD 5.
- b) Duplex blowers should be provided. Each blower should be sized to supply total plant air requirements.
- c) Individual diffuser drop lines should be equipped with control valves. Drop lines should be removable for service or replacement without dewatering the tank.
- d) Blowers should be sized to provide air for the airlift pumps and the sludge holding tank (if provided) in addition to that required for the aeration tank.

5. Sludge Decanting (Holding) tank

- a) A minimum volume of 2 cubic feet per capita should be provided.
- b) Air should be supplied at a minimum of 30 cubic feet per 1000 cubic feet of tank volume.