

# ACTIVATED SLUDGE SEWAGE TREATMENT PLANTS

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A wide range of sewage treatment plants for villages, towns, residential communities, hotels and industries are available from Hydrex to meet the requirements of as few as 1000 people to as many as 100,000. Hydrex systems are compact, economical, odor free, noise free, efficiency, easy to construct and simple to operate.

Magallanes Village STP



## ACTIVATED SLUDGE SEWAGE TREATMENT PLANTS

Activated sludge process is an aerobic biological process which uses microorganisms to purify the wastewater containing organic matter.

In the basic process, the wastewater, after primary physical treatment, enters the aeration basin where it is mixed with the activated sludge containing a high population of microorganism. The aeration basin content is a mixture of sewage and activated sludge which consists mainly of microorganism and inert suspended solids. The microorganism consume the organic matter as food and convert it into inert material and oxidized end products – mainly  $CO_2$ . The treated wastewater is then transferred to a gravity settling basin to separate the sludge. The settled sludge is collected and recycled back to the aeration basin to maintain the desired concentration of microbial population for treatment of the incoming wastewater and the clarified effluent is discharged into the receiving stream.

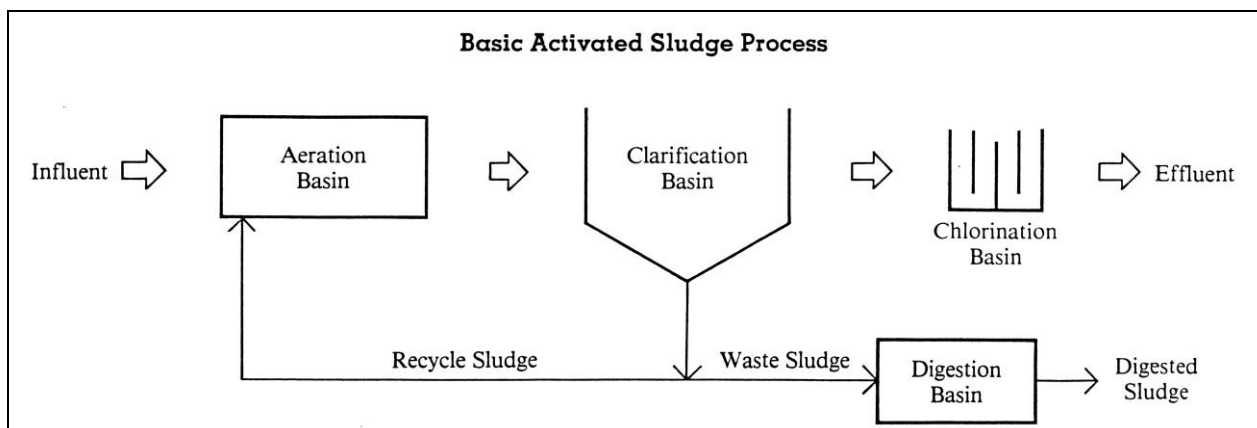
Because microorganism are continually synthesized in this process, a surplus amount is produced which must be removed from the system to maintain the correct concentration. This is done by discarding a portion of the excess sludge from the system either continuously or intermittently.

Activated sludge process is a highly reliable and efficient means of sewage treatment because it results in nearly total decomposition of organic matter through oxidation and minimizes excess sludge production. Lower sludge production significantly reduces the capital and operating costs associated with sludge treatment and disposal.

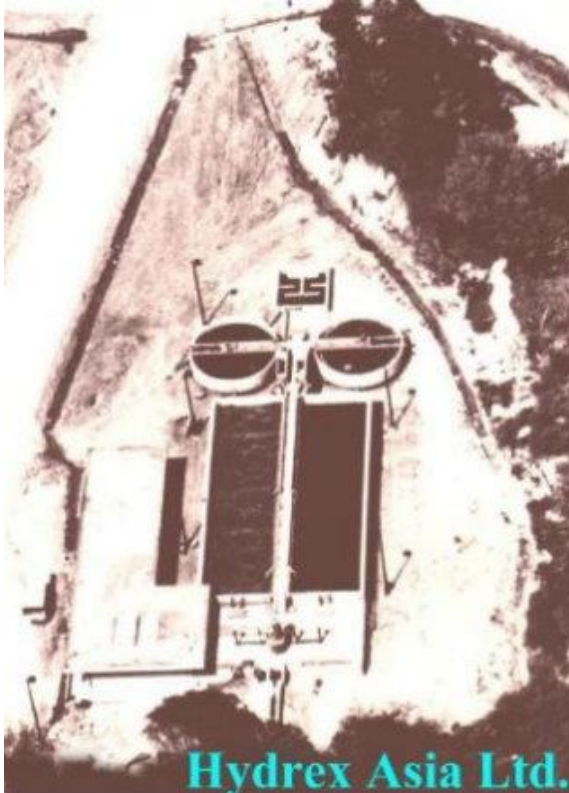
By utilizing a diffused aeration system for oxygen transfer and mixing, Hydrex plants produce a high quality, clean and clear effluent through a low cost, low maintenance and odor free operation.

Hydrex plants incorporate the most advanced equipment and are designed to meet the strictest air, noise and effluent discharge standards set by environmental protection agencies.

Hydrex plants provide efficient and economical treatment even under the most adverse conditions. Furthermore, maintenance costs are minimized because of such features as non-clog crown diffusers, rotary air blower, ruggedly built equipment, corrosion resistant material and unique plant design.

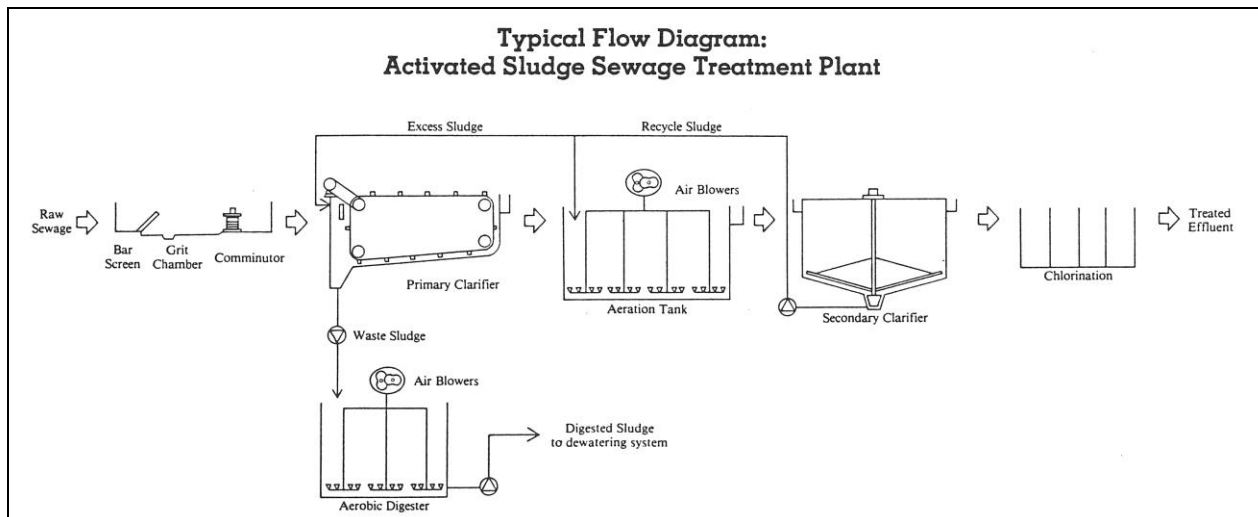


## SYSTEM DESCRIPTION



An activated sludge system consists of a number of interrelated components including:

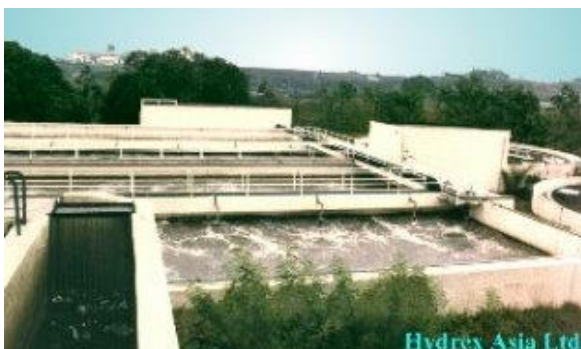
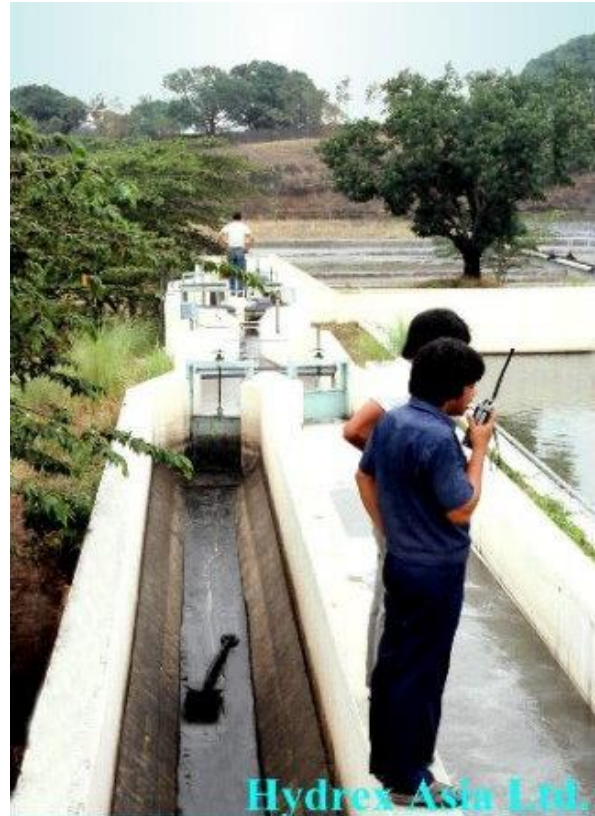
- Pretreatment such as screening, grit removal comminution.
- Primary settling to remove readily settleable solids.
- Aeration system including a basin of sufficient size to provide adequate retention time, an oxygen source and a means of mixing the aeration basin content.
- Final settling to separate solids from treated wastewater and a means of recycling the sludge back to the aeration basin and removing the excess sludge from the system.
- Post treatment such as chlorination, froth control and filtration.
- Sludge digestion, dewatering and disposal facilities.



## PRETREATMENT

### SCREENING

As the sewage is delivered to the treatment plant it is first put through a screening device to remove trash and large particles that may interfere with downstream operation of the treatment plant equipment. This can be a bar screen that may be cleaned manually or with mechanical devices.



### COMMINUTOR

A comminutor is used in many installation to grind solids that pass through the bar screen to an easily digestible size. The use of such a device tends furthermore to reduce odor, files and unsightliness often found around screenings that are handled by other means.

### GRIT REMOVAL

Grit should be removed from the wastewater to: protect moving mechanical equipment from abrasion and abnormal wear, reduce conduit clogging caused by deposition of grit particles in pipes or channels and prevent loading of pretreatment works with inert matter that may interfere with the operation of treatment units.

The choice of grit removal method and equipment used is dictated by such factors as head loss limitations, space constraints, economic consideration and size of the treatment system.



## PRIMARY SETTLING

Screened sewage is delivered to the primary clarifier for removal of readily settleable solids prior to subsequent aeration and biological treatment. This result in decreased load on the aeration system and substancial savings in power consumption. A circular or rectangular clarifier could be depending on flow rate, suspended solids content of the wastewater, plant design and other considerations. The settled sludge is collected and delivered to the digestion tank for further treatment and dewatering while clarifier overflow enters the aeration basin for biological treatment.

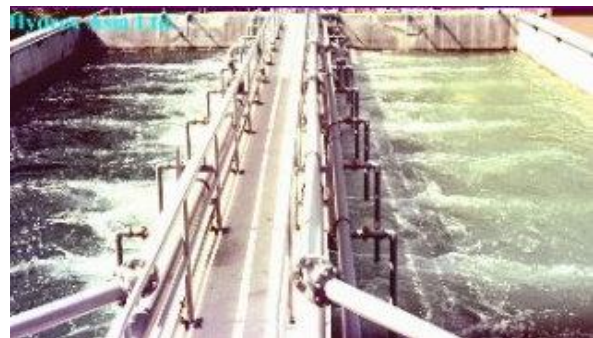


## AERATION SYSTEM

### AERATION BASIN

Air is introduced into the aeration tank through non-clog crown diffuser installed along one wall at the bottom of the tank. The rise of minute air bubbles through liquid creates a gentle rolling action of the entire tank content. This keep the incoming sewage and the liquid in the tank in complete mix condition and prevents solids from settling out while supplying oxygen for bacterial growth and biological treatment of the sewage.

The aeration basin is the heart of the activated sludge process. To produce the desired effluent quantity, numerous factors must be considered. Wastewater type and composition, flow rate and fluctuations, temperature, variations in waste characteristics, sludge concentration, sludge production and retention time, hydraulic detention, oxygen requirements and space constraints are among the variable that must be evaluated.



## AIR DIFFUSERS

Hydrex systems use the proprietary molded plastic non-clog crown diffusers that provide precise air control and effective dispersion of air through liquid.

A unique feature of the Hydrex diffuser is its specially designed ball check valve that prevents the sludge from entering the air line and clogging it. During air stoppage or shut down, the ball valve rests on the orifice preventing liquid and sludge from backing up into the air line. During normal operation the flow of air keeps the ball in suspension and opens the orifice.

Several diffusers are mounted on each diffuser assembly and each assembly includes a rate set valve and union for disconnection. The assemblies can be lifted out of liquid and removed for inspection without emptying the tank content or disrupting the air flow to the other diffusers.



## AIR BLOWER

Rotary positive displacement type air blowers are used on all Hydrex plants. A wide range of blowers is available depending on the requirements of the system. A standby air blower is usually provided to ensure continuity of air supply, and if necessary, additional air for usually high or peak flows. Air blowers and accessories selected for Hydrex systems are designed to offer quiet operation, high efficiency, low power consumption. Low maintenance and long service life.



## SURFACE AERATORS

As an alternative to air blower, Hydrex sewage treatment plants can be equipped with surface aerators.

Surface aerators are available for bridge, platform or float mounting, and are suitable for use in aeration tanks or sludge digestion tanks.

These aerators have been field tested to assure maximum oxygen transfer in any waste treatment application. So you can depend on an optimum balance between oxygen transfer and mixing to provide the best environment for biological treatment in a Hydrex plant.



## FINAL SETTLING

From the aeration basin, treated sewage, mixed with activated sludge, enters the secondary settling tank. Here, the sludge settles and is collected and returned immediately back to the aeration basin to maintain a concentrated microbial population in the system.

Any floating solids that may have passed through the aeration basin is collected in the clarifiers by a skimmer and returned also to the aeration basin for further digestion.

The clean and clear treated liquid passes over the effluent weir into a flume where it is directed to the chlorination tank and other post-treatment facilities.

Final settling basin design play a significant role in the successful operation of the treatment plant effluent quality. Factors such as flow rate, flow variations, sludge concentration , sludge collection, overflow rate, hydraulic retention and desired effluent quality must be considered when selecting a clarifier.



## POST TREATMENT

### Chlorination

The clarified effluent, prior to discharge to the receiving stream, could be chlorinated to destroy any pathogenic bacteria that may be present in the sewage.

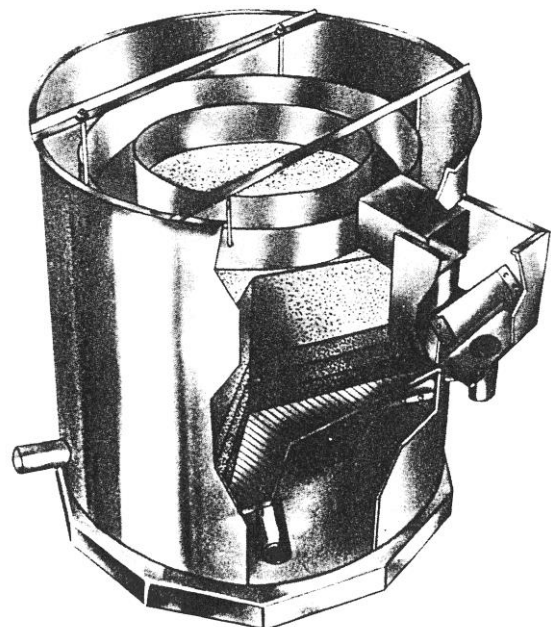
### Froth Control

If a high detergent content is present in the sewage, a froth control system that sprays treated plant effluent over the aeration tank could be supplied to suppress any foam than may develop.

### Filtration

Tertiary filtration could be employed for further reduction of suspended solids and BOD in the final effluent from a domestic or industrial waste treatment plant. Filtration will also give a safety margin to most treatment plants which occasionally carry over excessive suspended solids.

Hydrex automatic valveless upflow filters are designed specifically for wastewater filtration. For full details refer to bulletin No.211-02-R1.



## WASTE SLUDGE TREATMENT

### SLUDGE DIGESTION

During normal operation more sludge is produced and accumulated in the system that is needed for the biological treatment of the incoming sewage. The excess sludge is removed from the system by periodically diverting it from the system by periodically diverting it from the settling basin to the digester. Further treatment in a digester, either aerobic or anaerobic type, completes the digestion cycle and renders the sludge inoffensive and suitable for dewatering and disposal.

When selecting the type of digester, factors such as plant size, excess sludge production rate, space limitations, digester gas handling, economic considerations and operator quality must be considered. Only in large treatment plants can the use of anaerobic digesters be justified. Aerobic digesters are used without exception in small to medium size plants.



### FOR FURTHER INFORMATION

A full range of water and wastewater treatment systems and equipment are available from Hydrex. For further information, please contact us or our authorized agent.

### SLUDGE DEWATERING

Sludge drying beds or mechanical dewatering is employed to further reduce the volume of the sludge for ease of disposal.

The choice of the dewatering equipment and method used is dictated by such factors as space requirements, topographic conditions, economic consideration, size of the treatment plant, operator quality, proximity of the treatment plant to residential area and climatic conditions.



Authorized Agent: