IIECL

SEWAGE TREATMENT PLANT

A COMPLETE TECHNICAL GUIDE

INDION ION EXCHANGE & CHEMICALS LIMITED

Corporate Office D - 11, Diamond Park, GIDC Naroda,

Ahmedabad - 382 330. Phone: +91-8511580100

Email: export@indianionexchange.com

Website:www.indianionexchange.com

Indion Ion Exchange & Chemicals Limited (IIECL) provides water and wastewater treatment solutions that meet with environmental issues, at the global scale and appropriate to local regulatory and economic constraints. We support local authorities in meeting their objectives of protecting water resources, preserving biodiversity and combating climate change.

We assist municipalities, whatever their size, in carrying out their responsibilities towards water management and sanitation services.

Half of the water treated worldwide is urban wastewater.

Wastewater is another term for sewage; water that has been used in homes, industries, institutions, and businesses that is not for reuse and is generally collected in a sewage collection or drainage system. In general, raw wastewater is 99.9% water and 0.1% impurities.

The volume of wastewater continues to increase as a result of changing demographics, economic development and urban spread. Along with more stringent environmental safeguarding as a result of regulations and lifestyles, wastewater treatment is a major environmental challenge for local authorities.

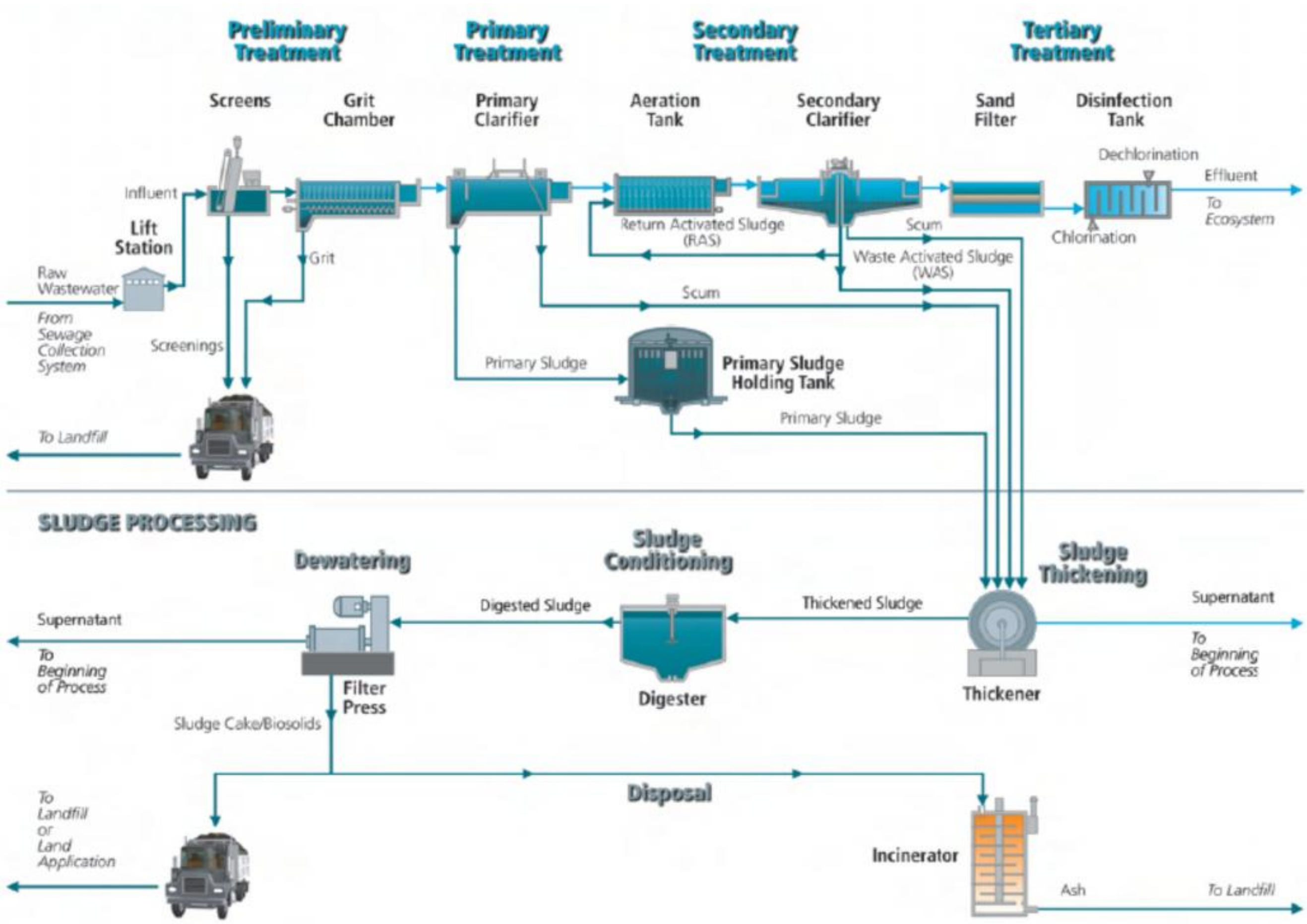
Urban wastewater treatment is also a technological and economic challenge; the goal is to preserve biodiversity and protect water resources while ensuring the wellbeing of local populations.

To support local authorities with urban growth, we design treatment systems of varying complexity based on the quality of the effluent to be treated and the sensitivity of the medium.

Sewage Treatment typically requires several treatment stages:

- PRELIMINARY TREATMENT
- PRIMARY TREATMENT
- SECONDARY TREATMENT
- TERTIARY TREATMENT

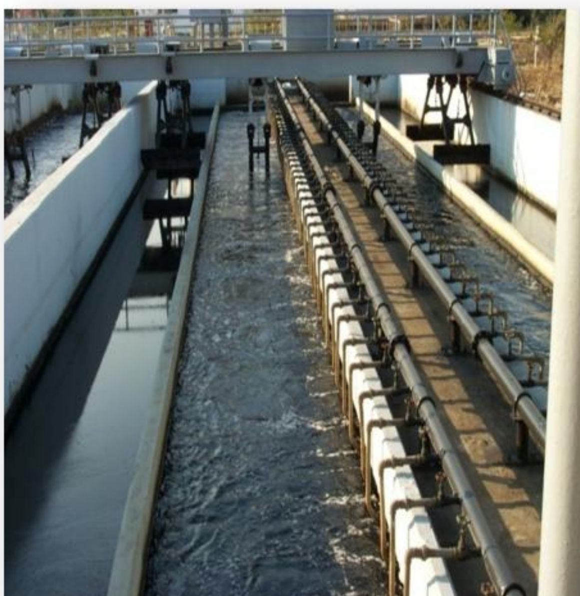
We provide all of the technologies for safe, environmentally compliant day-to-day sewage treatment plant operations, regardless of size. Our solutions contribute to customized, efficient and cost-effective solutions covering the complete sewage treatment cycle:



PRELIMINARY TREATMENT

The headworks include the influent channel, coarse and fine screens and aerated grit chambers where preliminary treatment occurs. Flow measurement, screening, pumping, and grit removal are the typical steps in preliminary treatment. Wastewater enters the influent channel into the coarse screens.

The screens remove large debris that enters the sewage collection system such as rags, tramp metal, sticks, broken glass, rocks, sand and the vast variety of other materials. Screens are utilized early in the wastewater treatment process to minimize pump and equipment damage within the facility. In many wastewater treatment plants, fine screens are utilized to remove smaller debris. All screened debris is removed and disposed as landfill.



The wastewater is then pumped into grit removal chambers. Air is introduced into the chamber to scour the organic materials from the grit before the grit settles to the bottom of the chamber. The settled grit or sand is delivered by a screw conveyor to a pit at one end of the chamber. From there, it is pumped by a grit pump to a grit/water separator. This debris is also disposed as landfill. Liquid separated from the grit is returned to the grit chamber. Wastewater from the grit chamber then flows to the primary clarifiers.

Oils and non-emulsifiable fats have to be removed because they would adhere to the equipment of the treatment works (e.g., basins and clarifiers) and interfere with the subsequent biological treatment. Oil and fat particles are made to collect on the surface by passing the waste water at an appropriate velocity through tanks of rectangular cross-section; they are skimmed off mechanically. Multi-plate separators of compact design and high efficiency are frequently used for oil removal: the sewage is made to pass from above through stacks of flat inclined plates; the oil adheres to the bottom surfaces of the plates and moves to the top where it is collected. With both these processes, the de-oiled water is discharged at the bottom.

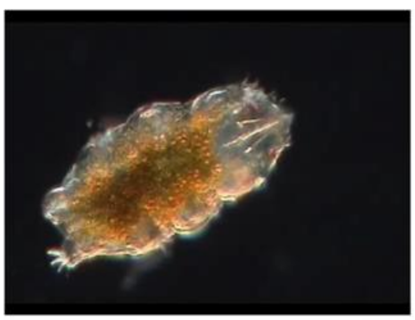
PRIMARY TREATMENT

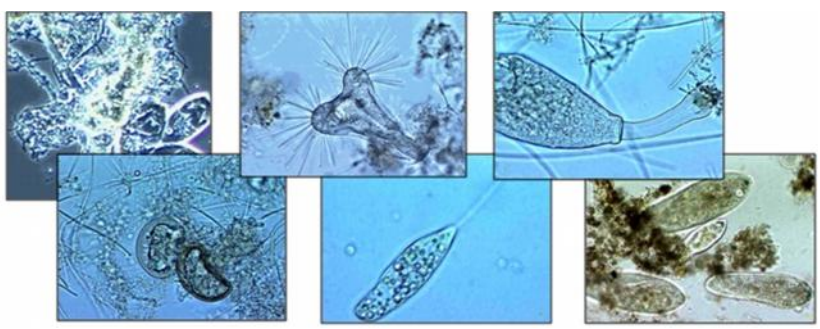
The primary treatment process reduces the solids content of wastewater through sedimentation. Wastewater slowly flows into large tanks called primary clarifiers where heavier particles are allowed to settle at the bottom of the clarifier. Scrapers move the settled solids (primary sludge) to sumps at one end of the clarifier. From there, the primary sludge is pumped into a holding tank where solids processing commences.

Solids lighter than water float to the top and are skimmed from the top of the primary clarifier and pumped to a thickener for solids processing. The greases and fats skimmed from the top of the clarifier are called scum. Primary treatment removes approximately 30 – 50% of the suspended solids. The remaining clarified liquid, containing mostly dissolved materials, flows to the secondary treatment stage.

BIOLOGICALTREATMENT

During secondary treatment, organic material is removed through biological treatment. Biological treatment of water using a wide variety of microorganisms, primarily bacteria. These microorganisms convert biodegradable organic matter contained in wastewater into simple substances and additional biomass.





Aerobic & Anaerobic:

Aerobic, as the title suggests, means in the presence of air (oxygen); while anaerobic means in the absence of air (oxygen). These two terms are directly related to the type of bacteria or microorganisms that are involved in the degradation of organic impurities in a given wastewater and the operating conditions of the bioreactor.

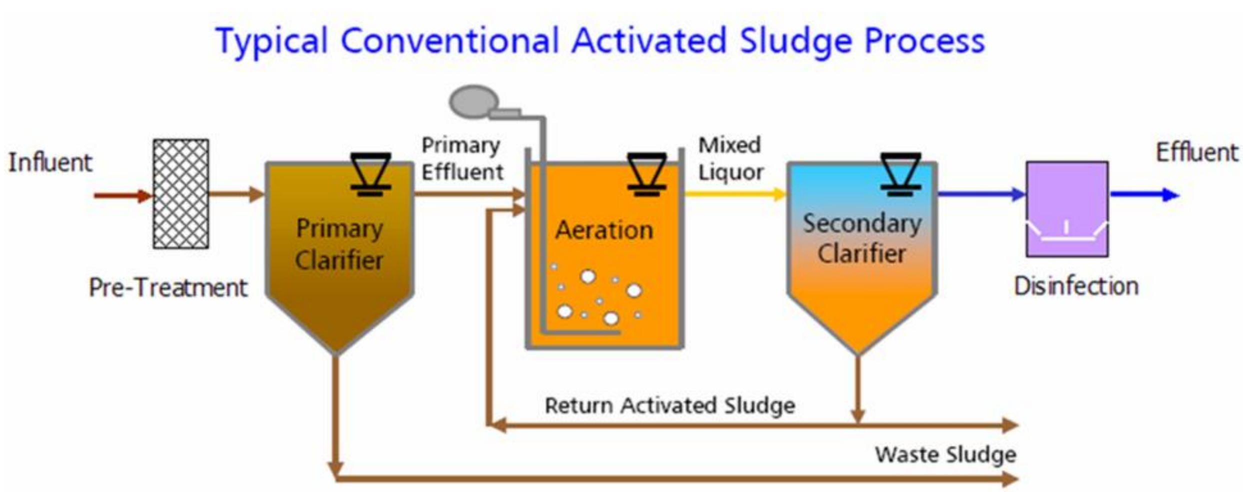
Depending on the environment, several types of biological processes may be used. Technologies include:

A. Activated Sludge Process

The most widely used biological treatment method is the activated sludge process. The activated sludge process requires an aerated tank containing bacteria that break down the organic materials. The bacteria use the organic material in the liquid and clump together to form a microbial floc, which is also known as activated sludge. This liquid flows into the secondary clarifiers where the activated sludge is allowed to settle. Flow enters the clarifiers from the bottom of the tank through a pipe located at the center of the tank. The clarifiers are designed to direct the flow from the center of the clarifier in a downward direction to encourage the solids to settle. The activated sludge settles at the bottom of the secondary clarifier.

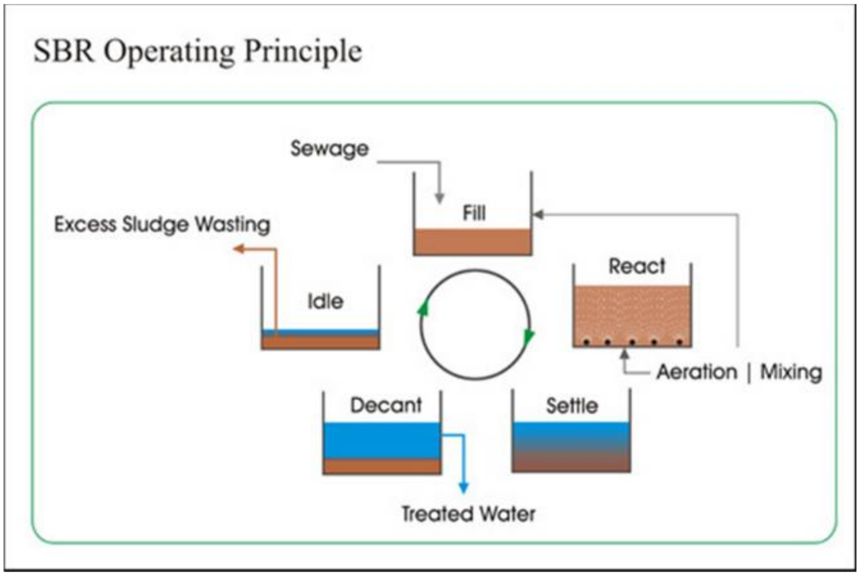
Some of the settled activated sludge is collected and is returned to the aeration tank to insure sufficient bacteria and organic waste supply to maintain the biological process. This material is called Return Activated Sludge (RAS). The activated sludge not needed for the biological process is called Waste Activated Sludge (WAS) and will be pumped to the sludge conditioning stage for further processing.

The clarified liquid, with over 95% of the organic materials removed, flows to the tertiary treatment stage. Scum, formed on the top of secondary clarifiers is sent to a thickener for solids processing.



B. Sequencing Batch Reactor (SBR)

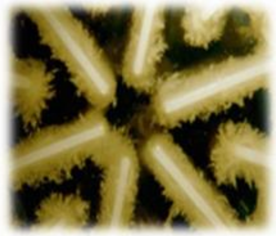
The Sequencing Batch Reactor (SBR) is an activated sludge process designed to operate under non-steady state conditions. An SBR operates in a true batch mode with aeration and sludge settlement both occurring in the same tank. The major differences between SBR and conventional continuous-flow, activated sludge system is that the SBR tank carries out the functions of equalization aeration and sedimentation in a time sequence rather than in the conventional space sequence of continuous-flow systems. In addition, the SBR system can be designed with the ability to treat a wide range of influent volumes whereas the continuous system is based upon a fixed influent flowrate. Thus, there is a degree of flexibility associated with working in a time rather than in a space sequence.



C. Moving Bed Bio Reactor (MBBR):

In the MBBR biofilm technology, the biofilm grows protected within engineered plastic carriers, which are carefully designed with high internal surface area. These biofilm carriers are suspended and thoroughly mixed throughout the water phase. With this technology, it is possible to handle extremely high loading conditions without any problems of clogging, and treat industrial and municipal wastewater within a relatively small footprint.





D. Membrane Bio Reactor (MBR):

Membrane Biological Reactor (MBR): This process combines a biological treatment using activated sludge with a physical separation treatment using submerged membranes (instead of secondary clarifier).

Combined treatment consists of combining several stages of treatment in package units called membrane bioreactors (MBRs). These bioreactors incorporate activated-sludge biological treatment as well as ultrafiltration-membrane clarification to produce effluent that can be discharged into sensitive areas or re-used.

IIECL provides all types of membranes (Hollow Fibre, Flat Sheet and External Pressurized) as per solution requirement and on customer demand.

Flat Sheet Hollow Fibre External Pressurized

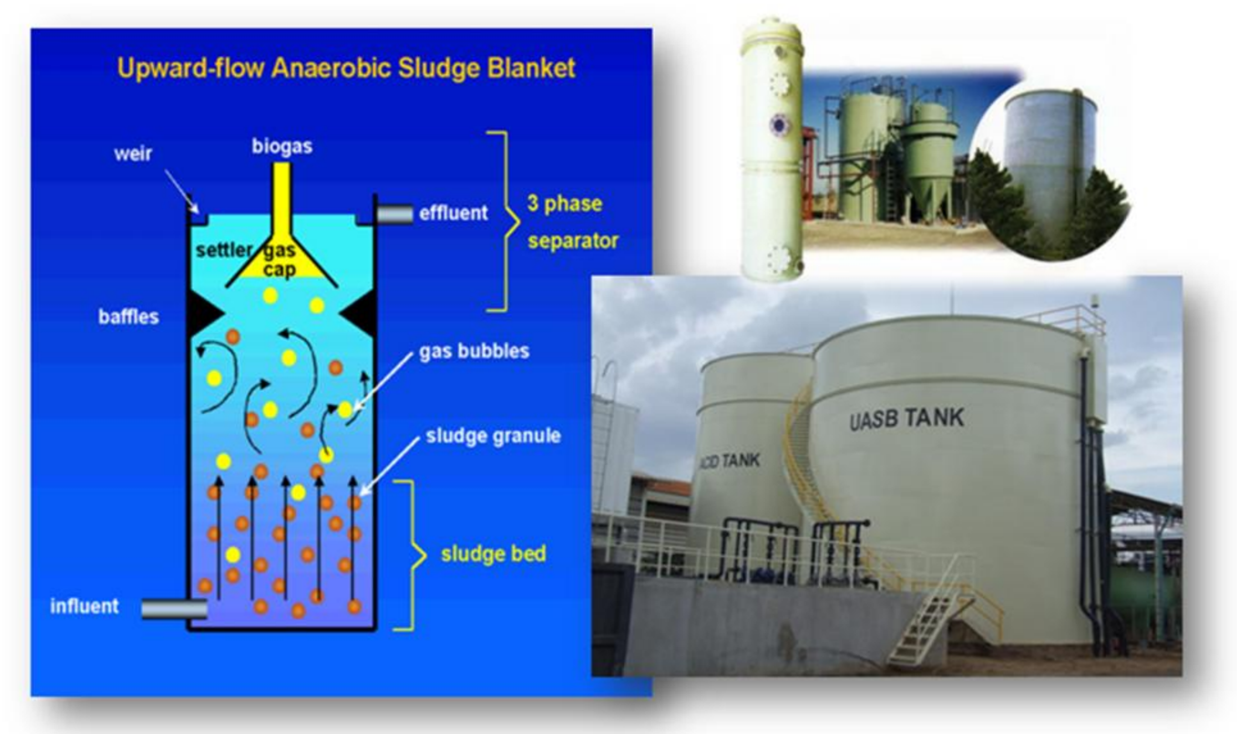





E. Upflow Anaerobic Sludge Blanket (UASB):

Upflow anaerobic sludge blanket (UASB) technology, normally referred to as UASB reactor, is a form of anaerobic digester that is used in the treatment of wastewater.

In a UASB-reactor, the accumulation of influent suspended solids and bacterial activity and growth lead to the formation of a sludge blanket near the reactor bottom, where all biological processes take place. Two main features decisively influencing the treatment performance are the distribution of the wastewater in the reactor and the “3-phase-separation” of sludge, gas and water. While the sludge should remain in the reactor, the produced gas is collected before the purified water leaves the reactor.



The influent point (sewage) is situated at the reactor bottom, the effluent discharge (treated wastewater) is situated in the upper part of the reactor, thus forcing the entering sewage to follow an upflow regime and to get into contact with the sludge blanket in the reactor. Here, the organic matter in the sewage is subject to anaerobic degradation by the bacteria contained in the sludge blanket, with methanogenic (“methane building”) bacteria producing methane gas (CH4) during the degradation processes. In order to prevent unwanted sludge discharge, separation devices (deflectors) are installed that prevent the further upward movement of the sludge and force it to sink back into the bed. The gas is collected in gas holders installed in the upper part of the reactor; for gas rising close to the reactor walls, an additional one may be installed.

Biogas with a high concentration of methane is produced as a by-product, and this may be captured and used as an energy source, to generate electricity for export and to cover its own running power.

TERTIARY TREATMENT

The tertiary treatment stage normally starts with the filtering of the clarified liquid that flows from the secondary clarifiers. The liquid is processed through a bed of sand or other filtering device that removes additional pollutants from the liquid. The water then moves to the disinfection tank. Water enters the disinfection tank where chlorine gas or sodium hypochlorite is metered in the tank. The water slowly moves through the tank to enable the chlorine to kill the microorganisms remaining in the wastewater that may be harmful to fish life. The disinfected water is then passed on to a dechlorination stage to remove the chlorinated materials that also could be harmful to fish life. Sulfur dioxide or sodium metabisulfate are the most cost effective chemicals utilized to neutralize chlorine.


Another disinfection method that eliminates a dechlorination stage is called ultraviolet disinfection. Ultraviolet light sources are submerged in a holding tank. The ultraviolet lamps emit radiation that penetrates the cell wall of the microorganism and is absorbed by cellular materials, which either prevents replication or causes death of the cell. As a result, pathogenic microorganisms are almost entirely inactivated or killed. The UV light disinfection technology is considered to have no adverse environmental impact. The water or effluent can now be discharged into the ecosystem.

SLUDGE PROCESSING

The purpose of primary and secondary treatment is to remove as much organic solids from the liquid as possible while concentrating solids in a much smaller volume for ease of handling and disposal. Primary sludge has a typical solids content of 4 – 6%. Sludge processing reduces the solids content of this sludge through biological processes and removes more of the liquid content of it prior to disposal.

The design options for each process will be dependent on the type, size, and location of the wastewater treatment plant, and the solid disposal options available. The design must be able to handle the amount of sludge produced and converted economically to a product that is environmentally acceptable for disposal. The typical sludge processing steps include:

- Sludge Thickening
- Sludge Conditioning
- Dewatering
- Disposal