# Biological Processes

Biological treatment is a more environmentally friendly wastewater treatment process than other wastewater treatment methods. Microorganisms feed on the complex materials which are present in the wastewater and turn the materials into simpler substances for preparing the water for further treatment Typical Biological applications are the following:

- Activated Sludge
- Membrane Bio- Reactor(MBR)
- Sequencing Bath Reactor(SBR)
- Expanded Granular Sludge Bed(EGSB)
- Auto-Thermophilic Aerobic Digester(ATAD)
- Sanitary Water Treatment

## Activated Sludge

### HNR System (HASCO BNR)

HASCO HNR Biological Nutrient Removal (HNR) process is a widely utilized technology for treating wastewater to a very high standard, particularly when stringent nutrients requirements are in force, the HNR process offers dependable and stable performance with minimal operator requirements.
Smart design makes the process highly cost effective and minimizes ongoing operating and maintenance issues.

- Advantages
  Ideal for stringent nutrient removal requirements
  Cost - effective installation
  High quality effluent

- Design Criteria
  The process is designed on a case by case basis. The design elements are flexible, allowing locally available form or existing tankage to be utilized, minimizing construction time and cost.

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## Membrane Bio - Reactor

**HASCO Membrane Bioreactor** (HSMBR) is a combination of a membrane process like microfiltration or ultra-filtration with a suspended growth bioreactor, and it is now widely used for municipal and industrial wastewater treatment. When used with domestic wastewater, MBR processes can produce high quality effluent wich is good enough to be discharged to coastal, surface or brackish waterways or to be reclaimed for urban irrigation. Other advantages of MBRs over conventional processes include small footprint and easy retrofit and upgrade of old wastewater treatment plants.

### Advantages

- Effluent with high quality hygiene standards
- High potential biomass concentration (10-25 g MLSS /L)
- The reactor has low volume and surface area
- Reduced sludge production
- More economical than other treatment systems

### Objectives

- Reduce biodegradable components
- Reduction of germs
- Reducing the turbidity and particles
- Reduction of surface-active substances

HASCO provides two MBR configurations exist : internal/submerged, where the membranes are immersed in and integral to the biological reactor; and external/side stream, where membranes are a separate unit process requiring an intermediate pumping step.

External / Side Stream HS-MBR

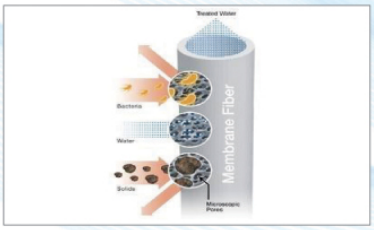
- Membranes placed externally (external loop to the bioreactor)

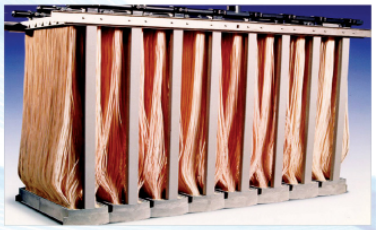
Internal HS-MBR

- Membranes placed Submerged in the bioreactor

### Application Areas

- Advanced treatment of domestic and industrial wastewater
- Discharge limits of water basins
- Treatment of water containing high pollution
- Obtain irrigation water from wastewater and recycling projects
- When wastewater treatment plan is adequate because of increased capacity
- Waste water recycling processes, which has high water consumption
- Conventional methods for inadequate settlement area



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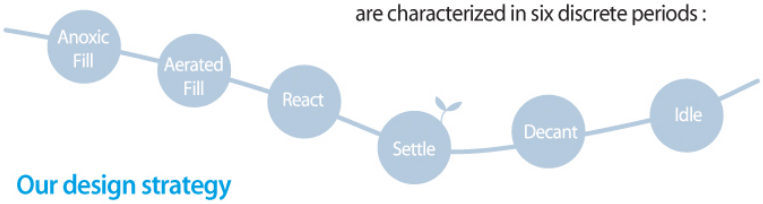
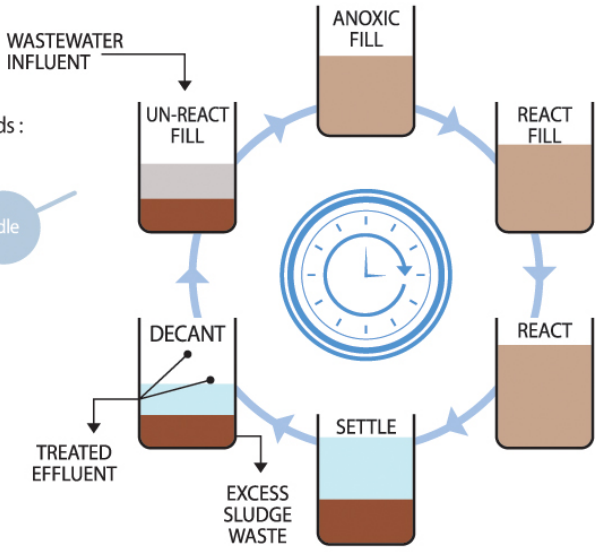
## Sequencing Batch Reactor

The HASCO Sequencing Batch Reactor (HSBR) is an activated sludge process designed to operate under non-steady state conditions. An HSBR operates in a true batch mode with aeration and sludge settlement and they are both occurring in the same tank. The major differences between HSBR and conventional continuous-flow, activated sludge system is that the HS-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 HS-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 flow rate. Thus, there is a degree of flexibility associated with working in a time sequence rather than in a space sequence.

### Sequencing Batch Reactor Process Cycles

The operating principles of a batch activated sludge process, or SBR, are characterized in six discrete periods :




### Our design strategy

- Biological process control and treatment potential
- Mass balance on the total solids generated in a reactor
- Biomass activities
- Treatment sequence construction

### Unique Features & Benefits

- P- removal capacities and more reliable process performance.
- capital cost savings, Permit the downsizing of the reactor and the mixing and aeration equipment due to an organic loads reduction through the wasted excess sludge of the HASCO SBR.
- Energy savings, Allow for significant energy savings due to inherent process improvement (up to 30% to 40%)

### Applications

- Municipal and industrial wastewaters
- Enhanced biological nutrient removal(ENBR)
- Total nitrogen < 3 mg / l
- Total phosphorus < 0.3 mg / l
- Water reuse and reclamation
- New plant construction
- Retrofit existing activated sludge systems
- Plant up-grades