Naturally

SBR

SEQUENCING BATCH REACTORS

For Conventional & Advanced

Waste Treatment

SBR A Proven Natural Process

Purestream's Sequencing Batch Reactors bring state-of-the-art, modern technology to a 75-year-old proven process for biologically treating wastewaters. The SBR system is a natural process of fill, react, and draw — without the use of chemicals. The necessary bacteria, which are found everywhere in nature, can be selectively chosen and cultured in the SBR process to remove carbon, nitrogen and phosphorous found in most wastewaters. The simplicity of this time-based process makes it easy to control and operate, resulting in an effluent that is low in carbon, nitrogen and phosphorous — usually lower than regulatory requirements.

The flexibility of the SBR system allows it to adapt readily to changing conditions of hydraulic and/or organic loads.

SPECIAL APPLICATIONS

Although the Purestream SBR process can be applied successfully to all biologically degradable wastewaters, with minimal operator attention, it is especially suited for the following applications:

1. Unusually strong and/or variable organic loads created by industrial wastes, such as:

- MEAT AND POULTRY PROCESSING
- DAIRIES
- LANDFILL LEACHATES

2. Highly variable daily hydraulic flow patterns found in:

- SHOPPING CENTERS
- SCHOOLS
- SUBDIVISIONS
- CAMPGROUNDS
- SMALL COMMUNITIES

3. Environmentally sensitive areas requiring advance treatment, such as:

- RESORT AREAS
- COMMERCIAL FISHING AREAS

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ADVANTAGES OF SBR SYSTEMS

- Control over micro-organism selection handles the organic load.
- Flexibility in biological nutrient removal due to excellent control of oxygen supplied.
- Simplicity of operation allows instrument process monitoring with remote data acquisition and control.
- Simple and minimal hardware result in low capital and maintenance costs.
- Hydraulic load is handled by liquid level control.
- Settling occurs under perfectly quiescent conditions.
- No sludge recycle mechanism is required.
- Process (SRT) control is automatic using volumetric sludge wasting techniques.
- Although especially suited to variable organic and hydraulic loads, can be applied to all biologically degradable wastewaters.
- Operation is automated using simple controls for minimal operator attention.
- System is easily expanded with modular tankage addition.
- Continuous flow plants can be easily retrofitted to the SBR mode.
- Process flexibility facilitates upgrading when needed.

SBR PROCESS

The SBR Process normally consists of the following 5 steps:

1) FILL, 2) REACT, 3) SETTLE, 4) DECANT and **5) IDLE.** These reactions all occur in the same tank(s) and are sequenced according to the time required for each phase. The programmable SBR control panel automatically controls the 5 process steps. The control panel is designed so that the time for each step may be easily adjusted in the field to adapt quickly to unexpected change in conditions of either organic or hydraulic loads. This operational flexibility, unique to the SBR process, insures future compliance with design performance even if the wastewater characteristics change.

This SBR process flexibility also guarantees maximum effectiveness in advance wastewater treatment, i.e., the biological removal of nitrogen and phosphorous. The key to this cost-effective method of nutrient removal is the inherent ability of the SBR system to easily provide anaerobic, anoxic and aerobic conditions for the groups of micro-organisms selected for nitrogen and phosphorous removal.

FILL: The **Fill** period begins with a certain amount of mixed liquor in the reactor. This provides the necessary micro-organisms to initiate biodegradation. During **Fill**, wastewater is introduced at a given rate via gravity or pumps, then mixed, and for a period of time, aerated.

The **Fill** period can be terminated at any point by merely changing the high-level sensor setting, or by changing the react time. This variable high-level setting provides the flexibility to operate the system initially at a low tank level, then to increase the tank level as the flow rate increases to reach design specifications.

REACT: **Treatment** begun during the **Fill** period is continued under controlled conditions in the **React** phase to remove the required nutrients, i.e., carbon, nitrogen and phosphorous. The **Treatment** control is air, either on or off, to produce anaerobic, anoxic or aerobic conditions. Controlling the time of mixing and/or aeration produces the degree of **Treatment** required.

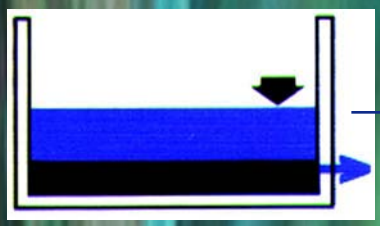
The **React** period is especially important in handling industrial and other hard-to-treat wastes. The on/off cycling of air and mixers provides complete nitrification, denitrification and phosphorous removal.

SETTLE: One of the major advantages of the SBR system is the creation of "perfect" conditions for the **Settle** period. There is no inflow of waste, no mixing and no injection of air. A healthy activated sludge floc settles rapidly — in 15-20 minutes. A design time of one hour is most adequate for the **Settle** period.

DECANT: Purpose of the **Decant** period is to remove the treated clarified supernatant without disturbing the settled, mixed liquor blanket.

A trouble-free, floating **Decant** mechanism is used on the Purestream system. The **Decant** phase does not begin until the sludge blanket has settled to prevent mixed liquor solids from being drawn into the intake pipe.

The **Decant** period should be as short as practical, usually no more that one to two hours. Extending the **Decant** time too long can cause sludge to rise. Also, this time is required as storage in a second reactor.



IDLE: The **Idle** period is not a designated time frame but rather is that period between completion of **Decant** and the beginning of **Fill**. **Idle** periods occur when actual flows are less than design flows. When **Idle** periods are long, aeration is required to prevent septic conditions from forming.

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WASTEWATER TREATMENT EQUIPMENT

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