AS-BIO Household Sewage Treatment Plant

Industrial Supplies Division

Bhatia Brothers Group

Solar & Non-Conventional Energy - ISD
Specifications Of SRP Waste Water Treatment Plant

**Basic Data:** The wastewater treatment plants (TP) with a continual or intermittent influx are widely used for biological waste water treatment with activated sludge in suspension. In continuous systems, secondary settler serves as an activating capacity. In intermittent systems, the function of a secondary settler is replaced with interruption of SBR reactor; purified water is discharged after the deposition of sludge. This technology has been used long time around the world. Now, this system is popular again, thanks to the improvement of the quality and reducing the cost of process control through the computer controlling system.

**Specifications:** There are two types of the TP based on the SBR technology: AS-BIO block contains two alternately operating SBR reactors, thereby eliminating the need for an influx of the accumulating tank. There is 1 SBR reactor in Monoblock-T with an accumulation reservoir on influx, where the waste water is accumulated during reactor operation. It is designed for up to 500 NC with a separate sewerage system. AS-BIO block is designed for high capacities; sewerage system can be as individual as well as shared. The system is flexible enough, so each TP adapts to any local conditions. In particular, you can choose to open system or fully closed reactors with independent ventilation above the surrounding buildings. It is advisable to use the system in the reconstruction and intensification of existing TP, and it can be installed in a variety of vessels, regardless of their shape and material. Cylindrical and cubic vessels made of concrete, steel, plastic and other materials are most frequently used for SBR reactors. Depending on the volume of the reactor, is possible to design the TP of any size. For a completion of technology, standard compressors and pumps from different manufacturers are used; it all depends on the price, quality and other characteristics. Specially designed control systems, often combined with the power distribution systems, are remaining original.

**TP AS-BIO Block**

**Plant Operation:** AS-BIO block is the water treatment plant, operating on the base of two SBR reactors. While one reactor is operating, the second is filling, so there is no need for a vessel at the influx. The rate of filling of the reactor is continuously evaluated by the computer. Depending on the amount of flow, it controls the activity of both reactors. If there few waste water is coming, the treatment plant will operate at minimum capacity: the system is regularly pumped out with so much purified water not to exceed the maximum of the time of filling the reactor set in advance.

If inflows increased, the water treatment plant begins operation at maximum power: a computer begins to adjust some phases within the specified time interval so that one reactor is emptied just before filling the second one.
In this way, the station will automatically maintain optimal modes of treatment, depending on the size of the inflow (about of 5-250% of design capacity). Thus, the system of AS-BIO block is AS-BIO block, its operation could be easily adjusted depending on the conditions, so it can be used in large communal TP (as in general, as well as in a separate sewage network).

This way of flexible control with two reactors, implemented depending on the flow of waste water to the station, protected by patents. This technology can be used with any form of tanks, if reactors have necessary volumes, and are similar in size.

For rough pre-treatment, rough hand or fine mechanical screens with vertical sand trap are used. Alternatively, a pump with macerator could be used.

Treatment Phases
- Filling (or filling and activation in the case of excess inflow)
- Activation.
- Denitrification.
- Settling.
- Pumping out the clear water.
- Rest period when reduced inflow.

The time of all phases of a wide range of minimum and maximum values is preliminary set on the computer. If the flow is normal, it is necessary to hold to the peak values. When the flow is reduced to a minimum, performance is decreased along with it. Using this system, you can set almost any of operating parameters. In a construction solution, where each reactor corresponds with aerated sludge collector, it is possible to implement the function of plant with biological phosphorus removal.

Selecting The Method Of Operation
- Manual servicing - operation of all electrical motors is controlled manually from the control center.
- Automated operation - treatment program is performed from the computer.

Standard Alarming On The Computer Panel
- Current phase in vessels.
- Level in vessels.
- Standard phases intervals.
- Calculated intervals of individual phases.
- Average influx.
- Estimated filling time.

Additional System Functions
1. Short-time power failure will not interrupt the operation of the TP: then the system will work in a loop from the point where it stopped before disconnecting. If disconnection was too long, the whole cycle will start from the beginning.

2. The system is fully control the valves and pumps. The system maintains a minimum amount of oxygen in the tank at the time of filling, delay or when technological devices are defective.

3. If the accident is occurred on technological devices, the system depending on the type of fault will automatically switch emergency operation mode.
4. Communication with the control system is not complicated; it is carried out by means of keyboard and two-row screen and the offers menu. Thank to this, knowledge requirements to the staff will be minimal.

5. Control system allows following:
   - Controlling of the course of treatment phases in the last 30 days. Phase changes are recorded immediately and after each subsequent hour. With this, the time, date, current phase and level in first and second reactors are recorded.
   - Connection the telephone answering machine, which could be used for calling the technical service in the case of accident.
   - Connection of a serial printer that will record the current information.
   - Connection of a modem, which will transmit the information on the treatment system condition to a central computer. At the same time, there will be a possibility to perform a control from the computer. The standard software is available to supply with the central computer on a special request. This computer can be used for transmission of service data by telephone or fixed lines. It will be possible to manage pre-set parameters remotely.

**Treatment Technology**

Waste water is getting for pretreatment: it settles the sand, and other coarse impurities are removed with the help of mechanical screens. Pre-treated water gets further into the distribution facility equipped with two solenoid valves, one for each SBR reactor. The reactor is filled, and bioremediation – activation begins in distribution facilities, an action that will provide partial removal of phosphorus, nitrogen and organic impurities.

After activation, the sludge settlement is performed in the reactor, then clean water is pumped out; excess sludge gets into the sludge collector. This is the last stage of the cleaning cycle. The reactor is prepared for the next cycle. The reactor was operated in turn. The computer will automatically optimize system depending on the volume of inflowing waste water in a wide range of 5-250% of design capacity.

If inflows are small, the sufficient volume of purified water required to provide optimum conditions for biological processes is remaining in the system. At the same time, depending on the decreasing of flow of waste water, power consumption is automatically lowered.

If inflows are increased, the cleaning cycle is reduced to remain second reactor empty up to filling up the first one. The minimum and maximum values of the individual parameters are programmed; the treatment plant is immediately reacting to hydraulic load.
**Advantages Of AS-BIO Block Waste Water Treatment Station**

- Water quality is very high. In other systems, it can only be achieved in exceptional cases. If the reactor vessel is large enough, the water will contain approximately 4 mg of biological oxygen demand in 5 days. In addition, the removal of total nitrogen will also be performed during the cleaning.
- The system adapts to the conditions of a particular area (in terms of construction, and in terms of uneven flow).
- Remote control and automatic operation. This ensures as the quality of water at the output, as well as the required safety.
- Sewage treatment plants AS-BIO block provide maximum protection of the environment. If one of the reactor fails, the other is automatically provide work of the plant until fixing. Thus, there are two independent production lines operating simultaneously.
- Thanks to the adaptability of the TP, this station you could be started even before the construction of sewage on imported waste water.

**Biological Treatment Of Waste Water** is used in country houses, cottage communities, hotels, restaurants, and recreation centers with permanent or temporary operation.

**AS-BIO Local Treatment Plants** are designed to serve of 5 to 300 nominal consumers (NC), and are used for treatment of the domestic utility waste water, including waste water from dishwashers and washing machines, as for a home as well as for a few villages. TP design is based on years of experience in the field of waste water treatment.

**Operation Concept**

AS-BIO treatment plants are used for wastewater treatment with a suspended activated sludge. Special air compressors fill the TP and control the operation of pumps pumping water from one chamber to another. AS-BIO waste water treatment plants have been designed based on the operating experience of large plants with finely continuous aeration as well as with the periodic flow. These processes have been united together in one treatment plant. Designing were based on the experience of waste water formation in the one household, when the inflow of waste water is irregular and most of the sewage collected twice a day. Therefore, the receptacle with the leveling function was installed in the inflow.
Hygienic Requirements

Treatment plant is completely closed; its cap is leaning with its own weight on the vessel walls that greatly reduce the spread of odors, so the TPS can be located near the houses. TP is supplied with outside air; the system is vented through the sewer inflow located over the roof of the building. If drainage is not ventilated (typical for older buildings and is possible with a vacuum valve installed on the top floor of the house), the ventilation is performed through a drain pipe or to the environment. With proper installation and operation, the water treatment plant does not spreading bad odors, because there are not any anaerobic processes within it. The system is very quiet. Below is the table of the noise levels for individual compressors. In general, the station almost silent, as the compressor is located under the cap.

<table>
<thead>
<tr>
<th>Used compressor</th>
<th>Noise level, dB (measured at a distance of 1 m)</th>
<th>Air circulation rate, m³/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hiblow 60</td>
<td>38</td>
<td>3.3</td>
</tr>
<tr>
<td>Hiblow 80</td>
<td>39</td>
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</table>

Advantages Of The AS-BIO Waste Water Treatment Plant

- Minimal costs
- Minimal footprint
- Easy installation, quiet operation
- Alarm system

AS-BIO 5 Treatment Plant Installation Scheme

Keys:
A - detention tank
B - activating tank
C - secondary dirt collector
D - sludge collection tank
E - compressors
Maintenance and servicing of are facilitated by the fact that all the TP production units can easily be removed and cleaned outside the plant. When reinstalling, it is required to maintain the original orientation and connections of all withdrawn and processed parts.

The system is fully automated and does not require daily maintenance. From time to time, it is necessary to make a visual inspection of the TP with the cap open. When sludge removing, it is necessary to clean the walls of the secondary dirt collector of a firmly adhered sludge with a brush. TP is equipped with separate sludge collector, which must be regularly emptied.

Sludge disposal of TP is a simple operation: plant is switching off with main switch for about 20 minutes. After sludge settling in a special sludge collector, the station is turned on in a flow state, and at the same time the plug of the hose of air lift of sludge collector is removed. The sludge deflated to bucket is aerobically stable (biologically inactive), and it can be used as fertilizer for plants, including seedlings.

On the base of calculations and years of operating experience in the Russian Federation, it is recommended to perform a cleaning every 3-6 months in average depending on the number of users, if the pollution comes in small volumes. Integrated air lift can pump out about 50% of the sludge collector volume; entire volume can be pumped out with electric pump. In the second case, it is more time required for cleaning. The amount of excess sludge is directly dependent on the removal of organic contaminants and may differ for individual installations of waste water treatment plants.

Sludge collector is the only place of sludge removal, because it receives the excess sludge automatically pumped from activating capacity. Sludge collector should be filled with clean water after the TP cleaning.

Activities For Waste Water Treatment Plant Operation In The Winter

The station is designed for separate sewage of waste water, which temperature in winter is usually corresponds to the work operating mode of the plant.
The system will not fail when the temperature of water in it will not fall below 5-8 °C. If the temperature will wall, the operation of station will be broken while the microorganisms adapting to lower water temperature. TP is installed fully under the ground, and is equipped with heat-insulation cover. If the ambient temperature drops below -25 °C, and at least 20% of the flow of waste water will be provided, the station will perform well and special measures for winter operation are not required.

Power Adjustment Of The Treatment Plant

Treatment plant capacity is factory set. The distribution of air from the compressor is controlled by central metering jets. System performance can be adjusted with clockwork device placed on the supply of electricity to the facility.

At health facilities, it is required to install power regulator on the electricity supply. Regulator at a set time interval will interrupt the power supply to the station. A break in the plant activity should not exceed 6 hours or the anaerobic processes could arise in the activation capacity, with the operation of the compressor during a day should be enough to provide a sufficient air for waste water treatment.

For recreational facilities working on weekends, in the absence of owners, it is recommended to install an interruption in operation in such a way that the station worked for 30 minutes, with an interruption of about 2 hours. In this economic operating mode, the TP will be operable without the influx of organic waste waters for more than a month. The main condition for this is the proper station operating before this period.

Setting Of The Power Regulator For AS-BIO 5 Type

<table>
<thead>
<tr>
<th>Number of NC connected</th>
<th>Duration of connection to the power supply network</th>
<th>Configuration</th>
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<tbody>
<tr>
<td>3-5</td>
<td>24 hours</td>
<td>Continuous operation</td>
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<tr>
<td>1-2</td>
<td>15 hours</td>
<td>1.5 hours switched on / 1 hour switched off</td>
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</table>

TP Base Case
- Biological TP with high degree of purification (up to 97%)
- Two phases of the TP operation: flow mode (cleaning process) and sludge removal (regeneration process)
- Warning lights in case of emergency
- Open water release to the relief is permitted
- Usage of water for irrigation is possible

TP With Sand Filtering
- Built-in sand filter for mechanical treatment of water
- Automatic filter self-cleaning several times a day
- Minimum 98% cleaning efficiency
- Release of water in the streams and ponds is permitted
- Usage of water for irrigation and watering the garden is possible

TP With Membrane Filter
- Sand filter is supplemented with membrane filter
- Mechanical post-treatment for hyperfiltration (to the extent of bacteria elimination)
- Purified water is completely disinfected
- Possibility of use the clear water in the premises as process water for flushing toilets and washing clothes
- Regeneration of the membranes is performed once a year
Sample Of AS-BIO Waste Water Treatment Plant Installation

AS-BIO TP consists of a complete self-supporting plastic container (1.0 x 1.0 x 2.4 m), with an internal division of special baffles installed in the pit (1.6 x 1.6 x 2.3 m), so that cap is located at 200 mm above the prepared space and protect the TP from rainwater. AS-BIO is placed on a sandy placement with thickness of 100 mm and then covered with sand. Along with the covering the TP with sand, the tank should be filled with clean water in such a way to the tank wall does not bend by the pressure. TP is come without the inflow; corresponding tie-in is performed on-site in accordance with the output flow of the house.

Cap of the TP can be green or white depending on the wishes of the customer. It sits firmly on the walls of the vessel under its own weight; it is allowing you to host the TP inside homes, garages, etc. TP is vented through a waste water inflow located over the roof of the building.

Before installing and mounting of the TP, tests should always be performed. AS-BIO is connected to the electrical power supply network via a separate cable PVS 4x1.5 mm. The TP package does not include the electrical connections in the house.

Simple clockwork device could be set in the room at the place of connection to adjust the performance by switching the TP off and light warning indicating the correctness of the TP operation (can be included in the package on request).

Compressor Equipment (Blowers)

The treatment plant TopolVater uses only the most reliable compressor equipment. Hiblow is the best in this region.

The SECOH is a leading global manufacturer of septic tanks and steadily established itself on the market of autonomous drainage systems.
Structure And Function Of Blowers: Lubrication free membrane blowers with collinear magnetic drive are the blowers. The transmission is the construction of two parallel electromagnets and axially moving anchor on which four magnets are mounted. A magnetic field is arising in electromagnets when the alternating current is supplied, which changes its polarity depending on current frequency. Magnetic anchor is attracted and repelled by the poles of an electromagnet and linearly moves to the side. Thanks to linear motion, the high efficiency drive with almost no friction is achieved. Membranes are installed at the ends of the magnet. Blower head together with two valves (suction and discharge) forms a membrane unit. Blower has two such units.

In case of damage to the protective membrane, integrated protective switch disconnect the blower. Thermal protection switch protects the blower from overheating.

Model Line-up And Specifications Of Waste Water Treatment Plants

<table>
<thead>
<tr>
<th>TP model</th>
<th>NC</th>
<th>Capacity (m³/day)</th>
<th>Peak load (l)</th>
<th>Input power (W)</th>
<th>Power consumption (kW/day)</th>
<th>Weight (kg)</th>
<th>Dimensions L x W x H (m)</th>
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<tr>
<td>(h=2.40)</td>
<td>5</td>
<td>1</td>
<td>250</td>
<td>60</td>
<td>1.44</td>
<td>250</td>
<td>1x1x2.4</td>
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<tr>
<td>Long (h=3.0)</td>
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<td>60</td>
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| AS-BIO-75 (h=3,0) | 75 | 12 | 3750 | 400 | 9.6 | 1050 | 4 x 2.16 x 3 |
| AS-BIO-100 (h=3,0) | 100 | 16 | 5000 | 600 | 14.4 | 1200 | 4 x 3,16 x 3 |
| AS-BIO-150 (h=3,0) | 150 | 24 | 7500 | 765 | 18.36 | 3100 | 4 x 4,16 x 3 |

Manufacturing Of The AS-BIO Treatment Plants

Assembly Shop

Finished-Products Storage Area
This additional monitoring module of the treatment plant, created on the base of observations of the TP operation. The module does not control, but only oversees the work of the plant.

Its main function is the display of the float and time intervals between its switching. This largely facilitates service of AS-BIO TP and allows determining the correctness of its operation.

**Advantages Of The TOM Module:**

- Operating mode selection: normal or economy (depending on the TP load).
- Implementation of the timer function: if there is not waste water inflow at the TP, the module switches on a supporting module, which provides the biological function of the TP up to 3 months.
- Diagnostics and fault indication: all failures in the operating module are identified, captured, and then displayed by a light or sound signal. This helps to reduce maintenance time of the TP.

**TOM- GSM Terminal (GSMT)**

GSMT cell module is an optional TOM module; it is used to send messages on the problems of the TP. GSM terminal is an optimal solution for remote monitoring of the TOM module. Reports of violations of the TP operation will be forwarded to a mobile phone. This module is normally used by the service companies that serve multiple AS-BIO TPs.

**Dosing Unit**

For removal of biological foam; for removing of the phosphorus; dosing of the chlorine and other chemicals.

**External Power Cabinet**

- Isolating fuse.
- Timer for intermittent operation of the TP.
- Light indication of the TP normal operation mode.

**Our Products**

**AS-BIO. Local TP for 5-150 NC**

- International patent No 282 411, Eurasian patent No 004 338.
- Fits for recreational facilities.
- Can be equipped with a sand filter, membrane filtration, dosing for chemical phosphorus removal.
- TOM monitoring module immediately reports failures.
- Transmitting the information.
**AS-BIO Block. Municipal area TP for 500-250,000 NC**
- Patent No 282 852, SBR reactors automated control system.
- Two independent manufacturing lines.
- Construction solution for general and local sewerage network.
- Multistage construction.

## The Principle Of Treatment Plants Remote Control

### A. TP control device.
Real-time TP management, recording of operational data.

### B. Manager communication with TP.
The data transfer is performed once a day for 2 minutes, it ensures a minimum cost of communication and instant notification of failures.

### C. Control room.
Senior technologist determines the cause of problems and begins to address them after analysis.

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