

PuraSys_{SBR}

Sequencing Batch Reactor

Florida Reference Manual



Only modules bearing the NSF® logo and designated PS1-XX are certified to NSF/ANSI Standards 40 and 245



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1.0 What's in the Box?

PuraSys SBR Models PS1-4 through PS1-8 (≤800 gpd) include (1) Novair 200 Aerator.

PuraSys SBR Models PS1-9 through PS1-14 (≤1,400 gpd) include (1) Novair 600 Aerator.

Additionally, each system comes in a box with the following components:

Controls	(1) Anua
Optional controls add-on	(1) Autodialer
Junction box	(1) Anua with 6 cord grips
Siphon/sludge pump	(1) Ebara Optima 3MS1
Clear water pump	(1) Ebara Optima 3MS1 (see note 3)
Float switch	(3) SJE-Rhombus (included with panel)
PVC stand kit, aerator	(1) Anua A-STAND-PS
PVC stand kit, pump	(2) Anua P-STAND-PS
Wire tie	(10)
1.25" Schedule 40 PVC parts kit with grommets	(1) kit for PVC pipe
Float bracket	(3) Sim/Tech STF-FHPB 1.25"
Stainless Steel screw for stand mounting clamp	(1) Package for Sim/Tech STF-FHHW 1.25"
Siphon pipe pre-drilled with 3/8" holes	(1) 1.25", cut length per tank dimensions
Stand mounting clamp	(4) Sim/Tech STF-FHHW 1.25"
J hook wire holder	(2) Sim/Tech STF-JHOOK
Stainless clamp	(4) 2.5" SS Clamp
Pump mounting clamp	(2) MTG-CLMP-SS-AS
Aerator mounting clamp	(1) MTG-CLMP-SS-PS
Air vent	(1) 2" Banjo threaded air vent
Sonic dampener 4", aerator	(1)
Vibration dampener 1" x 1.5", aerator	(1)

NOTE: 1. Use 1.25" Schedule 40 PVC piping for sludge pump and clear water pump.

2. For other clear water pump options, contact distributor or Anua.

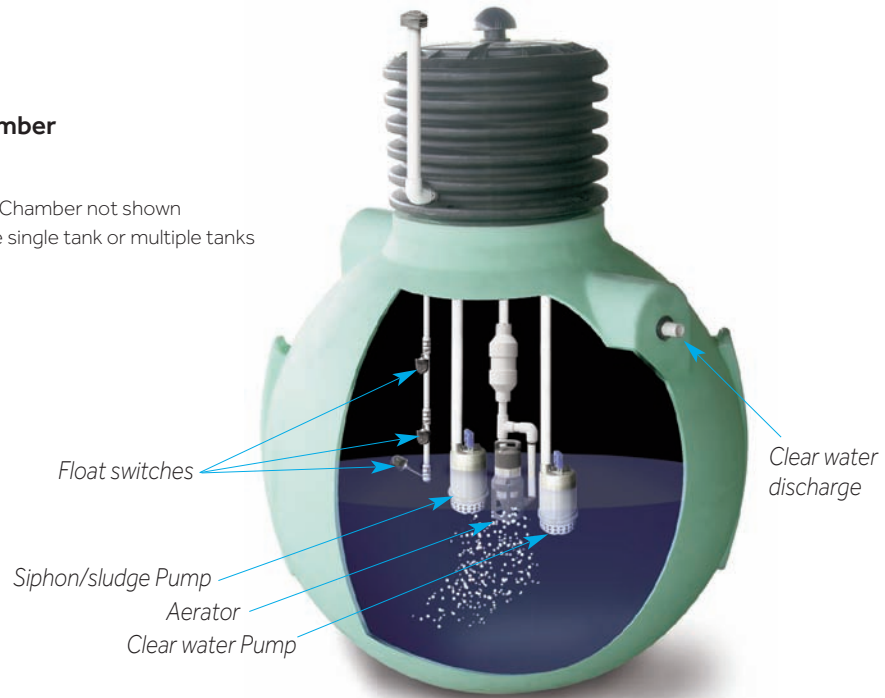
2.0 Anatomy of an SBR

Figure 1

Reactor Chamber

Notes:

1. Pretreatment Chamber not shown
2. System can be single tank or multiple tanks



2.1 Process Overview

1. Filling

Water enters reactor from pretreatment.

2. Reaction

Intermittent aeration allows for aerobic and anaerobic conditions which break down BOD and nitrogen.

3. Sedimentation

Solids settle to the bottom of the reactor.

4. Clear Water Discharge

Top portion of reactor (clear water) is pumped to effluent.

5. Idle and Sludge Return

The system waits for the beginning of the next cycle.

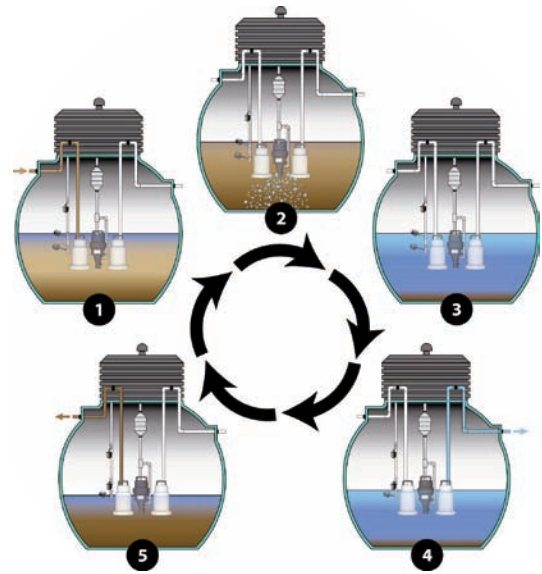


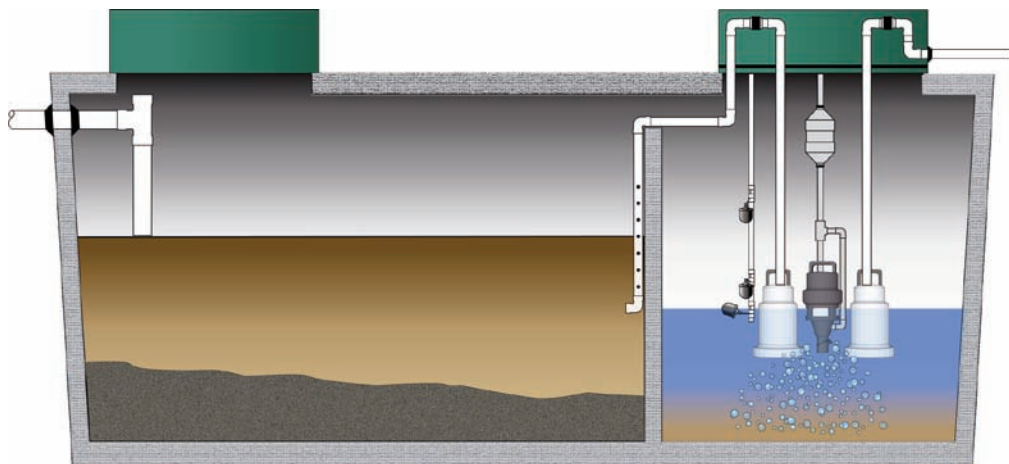
Figure 2 The SBR Process

3.0 System Design

3.1 Pretreatment or Septic Tank

The pretreatment tank, riser(s), and lid(s) must be watertight. The minimum volume shall comply with Table 1 in section 3.2. The size and configuration shall be in accordance with State or Local requirements for septic tank sizing.

Figure 3



Pretreatment or Septic Tank

(1 chamber tank. Examples include septic tank, pump tank, or holding tank. For 2 chamber configuration, contact Anua)

**Reactor Chamber
or Tank**

3.2 PuraSys SBR Reactor Tank Sizing for Florida

Model	Treatment Capacity (gpd)	64E-6.012 (2)(e) Table IV Flow (gal)	Number of Bedrooms	Building Area 64E-6.012 (2)(e) Table IV Minimum (ft²)	Building Area 64E-6.012 (2)(e) Table IV Maximum (ft²)
PS1-4	400	400	1 to 3	Up to 2,250	Up to 2,250
PS1-5	500	500	4	2,251	3,300
PS1-6	600	560	5	3,301	4,050
PS1-7	700	620	6	4,051	4,800
PS1-7	700	680	7	4,801	5,550
PS1-8	800	740	8	5,551	6,300
PS1-8	800	800	9	6,301	7,050
PS1-9	900	860	10	7,051	7,800
PS1-10	1,000	920	11	7,801	8,550
PS1-10	1,000	980	12	8,551	9,300
PS1-11	1,100	1,040	13	9,301	10,050
PS1-11	1,100	1,100	14	10,051	10,800
PS1-12	1,200	1,160	15	10,801	11,550
PS1-13	1,300	1,220	16	11,551	12,300
PS1-13	1,300	1,280	17	12,301	13,050
PS1-14	1,400	1,340	18	13,051	13,800
PS1-14	1,400	1,400	19	13,801	14,550

Model	Pretreatment (Septic Tank) Compartment Sizing 64E-6 Table II (gal)	Reactor Compartment Sizing (gal)
PS1-4	1,050	375 to 500
PS1-5	1,200	500 to 750
PS1-6	1,350	500 to 750
PS1-7	1,500	500 to 750
PS1-7	1,500	500 to 750
PS1-8	1,650	500 to 750
PS1-8	1,650	500 to 750
PS1-9	1,900	1,000 to 1,500
PS1-10	1,900	1,000 to 1,500
PS1-11	2,200	1,000 to 1,500
PS1-12	2,200	1,000 to 1,500
PS1-13	2,700	1,000 to 1,500
PS1-14	2,700	1,000 to 1,500

NOTE:

1. Compare system sizing using flow (GPD) per bedroom and building area. Select the most conservative sizing between the two values.
2. Where the number of bedrooms and the corresponding building area in Table IV do not coincide, the criteria which results in the greatest required treatment capacity shall apply.
3. Commercial systems must use 'Table IV - Commercial' for sizing.
4. Reactor compartment volume is based on **total** tank capacity

3.3 Clear Water Pump

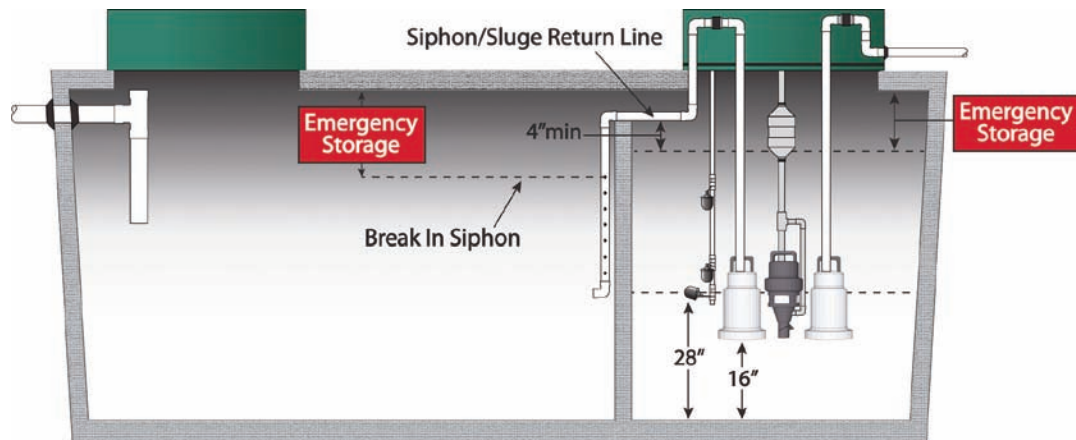
The clear water pump (discharge pump) is an integral part of the system. This is advantageous since the SBR is essentially a primary tank, treatment unit, and pump tank all-in-one. The pump provides timed dosing for a downstream component such as a polishing filter or drainfield. The standard kit contains a typical 0.5 HP effluent pump. A larger pump can be included in the kit where required. The clear water pump can be used to discharge to the following:

- Gravity trench or bed
- Low Pressure Pipe (LPP) drainfield
- Drip irrigation

3.4 Emergency Storage and Alarm Conditions

PuraSys SBR controls the movement of effluent through the system in a timed sequence of batches. PuraSys SBR incorporates a clear water discharge pump. Since treated effluent is timed dosed from the system, adequate emergency storage must be provided. This is typically provided in the pretreatment tank due to the operational sequence of the controls. For a one tank, 2-compartment configuration, the reactor chamber can be included in the emergency storage calculations.

Figure 4



Emergency storage in typical two compartment tank

1. One Tank, 2-Compartment Configuration

The total emergency storage volume is calculated based on the available volume in the pretreatment tank and the reactor chamber/tank above the normal operating levels to the inside tank lid. Since the chambers are connected via the air space above the baffle wall, volume in both chambers can be counted for emergency storage. In some jurisdictions, the riser volume can be counted for emergency storage. Emergency storage can be calculated as follows:

- **Pretreatment tank:** Determine the volume between the top siphon hole to the top of the tank (inside lid).
- **Reactor chamber:** Determine the volume between the high water alarm and the top of the tank (inside lid).
- Per Florida tank approval, determine the volume in the risers.
- Total storage volume = Pretreatment + Reactor + Risers

2. Two Tanks Configuration

The total emergency storage volume is calculated based on the available volume in the pretreatment tank above the normal operating level to the inside tank lid. In some jurisdictions, the riser volume can be counted for emergency storage. Emergency storage can be calculated as follows:

- **Pretreatment tank:** Determine the volume between the top siphon hole to the top of the tank (inside lid).
- Per Florida tank approval, determine the volume in the risers.
- Total storage volume = Pretreatment + Risers

3. Alarm Conditions

An alarm will trigger under the following conditions:

- High water float activated in reactor chamber.
- Aerator current <1 or no current.
- Siphon/sludge pump current <1 or no current.

The operational sequence is outlined below:

- If the clear water discharge pump fails or malfunctions, a high water condition will occur in the reactor chamber. The high water condition will trigger an alarm. The high water alarm will suspend operation of the siphon/sludge pump.
- If the current sensor does not read proper current to the aerator, an alarm will trigger. The aerator alarm will suspend operation of the siphon/sludge pump.
- If the current sensor does not read proper current to the siphon/sludge pump, an alarm will trigger. At this point, this pump is not operational.

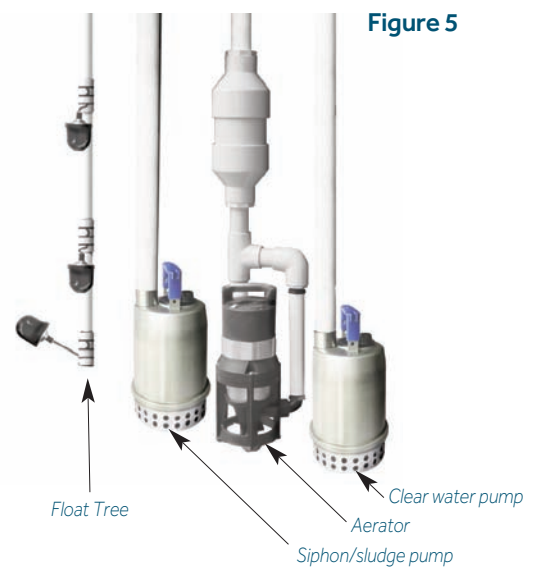


Figure 5

4.0 System Installation

4.1 Site Clearance

- Clear site vegetation as required (minimize site disturbance).
- Provide sufficient access to proposed system.

Installation Warning

Do not backwash a water softener into the system.

4.2 Pretreatment or Septic Tank and Reactor Chamber

- Supply and install pretreatment tank and sewer pipe from the dwelling in accordance with applicable State or Local regulations. The pretreatment tank must be watertight against ground and/or surface water infiltration and exfiltration.
- Install pretreatment tank on stable, compacted fill (e.g. stone $\leq 1"$ or similar material).
- Pretreatment tank must be backfilled with suitable material as recommended by the manufacturer. Backfill must be free of debris and large or sharp objects.
- Install water tight risers over access ports to provide access for maintenance and sludge removal.
- Install aerator stand, siphon/sludge pump stand, clear water discharge pump stand, and other components in reactor chamber per installation checklist. The aerator, siphon/sludge pump, clear water discharge pump, timer float, and high water alarm float heights are factory set.
- Install siphon/sludge return line from the pretreatment compartment to the reactor chamber.
- Secure the pre-drilled siphon pipe in the pretreatment tank with the top 3/8" hole at the correct height as indicated in the design.
- Connect the clear water pump discharge line to the drainfield in accordance with applicable State or Local regulations.
- Backfill and grade around the pretreatment tank to prevent infiltration of surface water.

See *PuraSys SBR typical drawings for further details on layout.*

Table 2 PuraSys SBR Pretreatment Tank Siphon Pipe Dimension from Tank Bottom and Pump Out Requirements

Liquid Depth (inches)	Siphon Pipe 90° Elbow Height from Inside Tank Bottom (inches)	Depth of Sludge Requiring Tank Pumping (inches)	Combined Volume of Scum & Sludge Requiring Tank Pumping
40	16	10	1/3 or 33%
42	17	11	
44	18	11	
46	18	12	
48	19	12	
50	20	13	
52	21	13	
54	22	14	

NOTE: For tank depths <36" or >54", please consult Anua.

4.3 Reactor Tank (if applicable, for two tank systems)

- Supply and install the reactor tank in accordance with applicable State or Local regulations. The reactor tank must be watertight against ground or surface water infiltration and/or exfiltration.
- Install reactor tank on stable, compacted fill (e.g. stone $\leq 1''$ or similar material).
- Reactor tank must be backfilled with suitable material as recommended by the manufacturer. Backfill must be free of debris and large or sharp objects.
- Install water tight risers over access ports to provide access for maintenance and sludge removal.
- Install aerator stand, siphon/sludge pump stand, clear water discharge pump stand, and other components per installation checklist. The aerator, siphon/sludge pump, clear water discharge pump, timer float, and high water alarm float heights are factory set.
- Install siphon/sludge return line from the pretreatment tank to the reactor tank in accordance with applicable State or Local regulations. The siphon/sludge return line must be adequately supported to prevent damage during backfilling.
- Secure the pre-drilled siphon pipe in the pretreatment tank with the top 3/8" hole at the correct height as indicated in the design.
- Connect the clear water pump discharge line to the drainfield in accordance with applicable State or Local regulations.
- Backfill and grade around the reactor tank to prevent infiltration of surface water.

4.4 Site Restoration

- The riser lids must be installed above grade with the ground landscaped to divert storm water away from the area.
- Backfill should be suitable, loose, workable material. Backfill must be free of debris and large or sharp objects.
- Compact backfill sufficiently to adequately prevent settlement.
- Landscape (e.g. grass seed, sod, straw, landscape stone, xeriscape, etc.) the sloped backfill area and any trench excavation lines with a suitable indigenous seed variety or use other methods.
- PROVIDE EROSION PROTECTION AS REQUIRED PER DESIGN PLAN.

Installation Warning

If you are not using an air break on the clear water pump discharge pipe, then install a check valve!

Construction Warning

During construction, harmful chemicals such as paint and solvents can harm the system microbes if dumped down the drain. These items should not be allowed into the treatment plant.

5.0 System Wiring

The cables are coded to match the connections between the aerator, pumps, and float switches to the junction box and control panel.

The smart control panel is housed in a NEMA 4X enclosure. The wiring diagram and instructions are located inside the panel. **Incoming power must be 240V, 1 Phase and 120V, 1 Phase.**

5.1 Power Supply

The system must be wired by a person qualified to do electrical work per the applicable State or Local electrical code.

The control panel requires two separate incoming power feeds as follows:

- 20A, 2 Pole, 230V breaker
- 20A, 1 Pole, 120V breaker



Figure 6

Recommended Surge Suppression

In order to add extra protection to the control panel, the addition of external surge suppression is recommended. The surge suppressor should be attached in parallel to the junction on the main power line.

6.0 Reactor Air Supply, Venting, and Plumbing

6.1 Aerator Inlet Air Supply

- Aerator must be supplied with fresh oxygen.
- Direct aerator air tube into vent housing and cut to proper length to insure hose will rest inside of vent housing without impeding air flow to aerator.
- Air vent included in the kit is not required for use. However, air tube must exit to atmosphere in order to obtain fresh oxygen to inject into aerator
- Ensure the aerator is properly secured to the riser with the clip included in the kit.

6.2 Reactor Atmospheric Venting

- Reactor must be vented to atmosphere!
- Use vented riser lid or vent piping with vent guard.

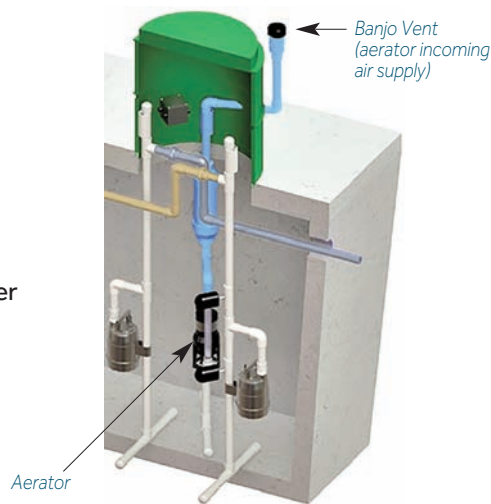


Figure 7 Riser with Vent Pipe

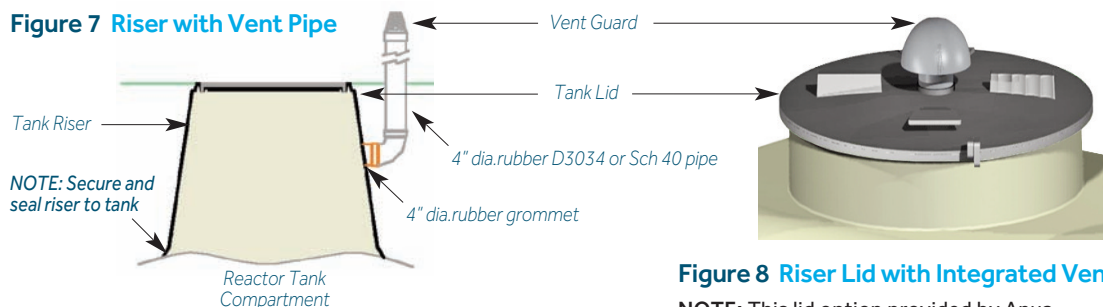


Figure 8 Riser Lid with Integrated Vent

NOTE: This lid option provided by Anua

6.3 Reactor Plumbing

- Siphon/sludge pump and clear water pump must be plumbed with quick disconnects. Unions are included in the kit.
- If you are not using an air break on the clear water pump discharge pipe, then install a check valve.
- In cold weather climates subject to freezing, slope clear water pump pressure line for drainback to reactor chamber/tank and do not install a check valve.
- Ensure the pumps are properly secured to the riser with the clips included in the kit.

7.0 System Startup

Once the system is installed, the pumps, aerator, and float switches must be tested to ensure that they each work. The bottom float switch must be in the 'up' position in order to test the clear water pump.

The tank(s) should be filled with water in order to verify tank(s)/risers watertightness. After completion of the watertightness testing, the system should be started to check for any plumbing leaks. When start-up is completed, the system can be left 'on'. The system will remain in vacation mode until water begins to flow from the facility.

8.0 Smart Control Panel Overview

The smart control panel is designed to be simple and easy to operate. All key adjustments and readings can be accessed through the four button keypad. Operational data is stored in the PLC.

The smart control panel optimizes the SBR process. The following settings can be adjusted:

- Aeration time per cycle (min)
- Fill pulse time (sec)
- Sludge return time per cycle (sec)
- Clear water pump timer settings (min)

The smart control panel records the following information:

- Siphon/sludge pump run time
- Siphon/sludge pump cycle count
- Clear water pump run time
- Clear water pump cycle count
- Aerator run time
- Aerator cycle count

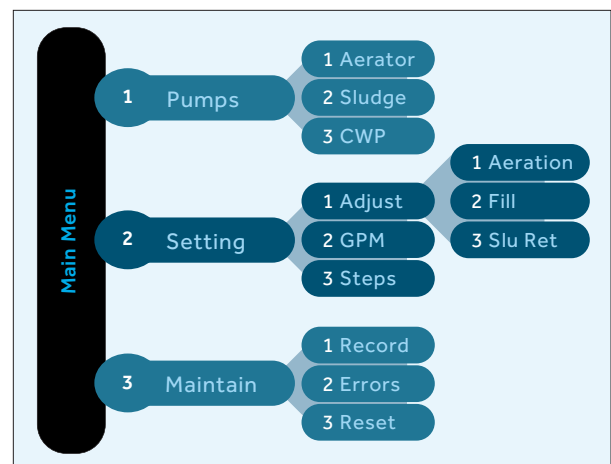


Figure 9

The controller display and setting instructions are located inside the panel. Mechanical components can be manually operated using the HOA toggle switches located inside the smart control panel.

9.0 Warranty

Warranty:

- Anua warrants the PuraSys SBR for a period of two years, unless otherwise specified by the regulatory authority, from the date of delivery. This warranty is subject to the *Terms and Conditions* section and the PuraSys SBR being operated in accordance with the parameters outlined in this manual and the owner complying with the parameters outlined in this manual.
- In addition, Anua will, at its own expense, repair and replace any defective parts of the PuraSys SBR, which manifests itself within two years, unless otherwise specified by the regulatory authority, from the date of delivery.

Terms and conditions:

- This warranty does not apply to any defects whether patent or latent, and whether workmanship or materials or design of works carried out by any independent contract, or any failure due to accidental or malicious damage, or failure to comply with recommendations for operations and maintenance, or unit abuse, fair wear and tear, frost, storm damage, infiltration of storm or surface water or any other such climatic conditions or acts of God generally.
- In particular note that this warranty will not operate unless the customer can produce written evidence of the system having been desludged as required.
- Notwithstanding this warranty if the cost of remedial work is increased due to delay on part of the customer informing of the problem, we reserve the right to invoice the customer for such increased cost.
- This warranty is strictly limited to the replacement of product supplied by Anua. It specifically excludes all other alleged headings of loss, including consequential loss.



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