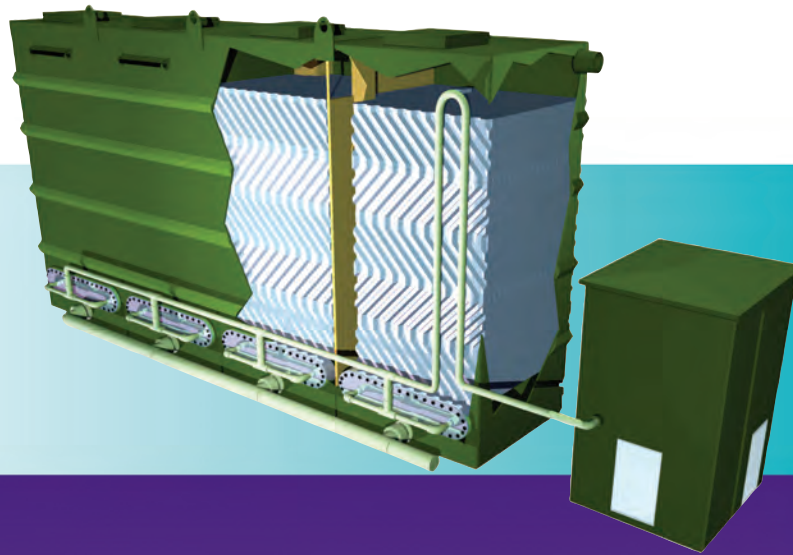


# Submerged Aerated Filter (SAF™)

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**Compact, high-performance, submerged  
fixed-film biological reactor for the treatment  
of both domestic and industrial wastes**



# Submerged Aerated Filter

## CONCEPT

Utilizing a simple yet clever design, the SAF has few moving parts, requires very little maintenance, and is easy to operate. 10/15/5 (TSS/BOD/NH<sub>4</sub>-N) effluent is achieved after clarification. SAFs require no regular operator attendance, and are generally used for installations up to 3,000 P.E. There are hundreds of installations around the world. Coated steel or stainless steel construction and use of high-quality components mean that SAFs will give many years of service. They can be located above or below ground.

## DESIGN

The SAF could be described as a “box of media”. It utilizes a rigid, corrugated, structured polypropylene media to give a high surface area for biomass attachment (200 ft<sup>2</sup> per ft<sup>3</sup>). The media is arranged into cells-in-series where effluent is contacted with the fully submerged media in the presence of co-current aeration.

The external walls of the SAF are manufactured in 1/4 inch steel or 1/8 inch 304 stainless steel, with pressed ribs for stiffening. The surface is coated (choose a color!) and may also be insulated for extreme environments. All plumbing is polished stainless steel and ABS or PVC plastic as standard.

Air is supplied by two low-maintenance regenerative blowers (Duty-Standby). These are housed in a fiberglass kiosk along with the controls. The kiosk may be sound-proofed for sensitive urban environments. Air enters the process below the media via fine bubble membrane diffusers.

A secondary clarifier tank follows the SAF for removal of any biomass that sloughs off the media during operation.

## PERFORMANCE

Typically within 2 to 3 weeks of start-up a SAF will achieve a 10/20 effluent standard (takes less than 1 week on a re-start where a biofilm has been established before). Nitrification then ensues within 2 to 6 weeks, depending on the influent water temperature.

## BNR (Biological Nutrient Removal) FLOW SCHEMES

Biological phosphorus and nitrogen removal can be achieved with the SAF since the design incorporates sequential staged operations as required for BNR flow schemes.

Phosphorus removal utilizes the anaerobic, balance tank (septic tank) used prior to the SAF. Recycled sludge from the final clarifier is mixed with the influent in this stage. Nitrogen removal is then achieved via denitrification in the first cell of the SAF where, with no air injected, and the introduction of recycled nitrified effluent from the end of the process, the process becomes anoxic.

The latter SAF cells are fully aerated and BOD removal and nitrification are achieved in these. Full BNR requires a four-cell SAF, minimum.

Typically effluent from a full BNR scheme will be:

- BOD less than 10 mg/l
- Total nitrogen less than 5 mg/l
- Ammonia nitrogen less than 1 mg/l
- Total phosphorus less than 0.5 mg/l



The design of the SAF is compact and efficient—less than 1/4 the size of suspended-growth aeration tanks of comparable flow and BOD capacity.

## OPERATION AND MAINTENANCE

Regular operation requirements include weekly inspection and de-sludging (less than an hour) and monthly inspection of aeration pattern. Maintenance is minimal as there are no moving parts in contact with the wastewater. Typically the air filter for the blowers needs to be replaced every six months (a five-minute job), and the diffusers need to be replaced every seven years (approximately 1/2-day operation).

## ADVANTAGES

- Units are pre-assembled for rapid installation
- Units are easily transported
- Compact, efficient design, less than 1/4 that of a comparable suspended growth aeration tank
- Minimal regular maintenance
- Simple to maintain
- Low sludge yield factor (common in fixed film processes)
- Long life
- Quiet operation with low odor and low visual impact—ideal for sensitive areas
- High-quality effluent, exceeding secondary treatment requirements, can be used in BNR flow schemes

## AVAILABLE OPTIONS

- Automation packages including real-time monitoring from a remote location
- Larger capacity designs, either in shop-fabricated tanks or assembled in precast or cast-in-place concrete tanks
- Stainless steel walkway, handrail, and ladder/stairs for access
- Pretreatment and matching final clarifier tanks

## RENTAL UNITS

PWTech offers SAF units for rent in addition to sale. Because of their compact nature and clever design, SAFs are easily transported. This makes them ideal for a variety of applications, including:

- Additional treatment where plants are failing to meet consent limits
- Emergency use due to equipment failure
- Use during plant upgrades
- Temporary facilities (such as military operations or large construction operations)
- Pilot studies

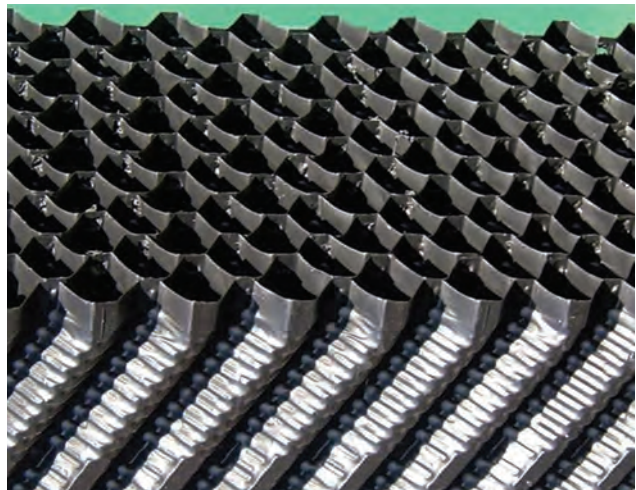
PWTech will arrange transport to site, installation, and periodic inspection of the units to ensure satisfactory operation. Rental units include the SAF, the clarifier, and an enclosed kiosk housing the blowers and controls.



Pre-assembled units are easily transported and rapidly installed.



SAF units can be trailer-mounted for mobility, making them ideal for emergency, supplemental, or temporary use, or for pilot studies.



Rigid, corrugated structured polypropylene media provides substantial surface area for biomass attachment.

## Standard Package Plant Detail

Model	Approx Population Equivalent	BOD Capacity (pounds/day)	Max Flow (gpd)	SAF Cell Size (ft)	No. of SAF Cells	Footprint (incl. kiosk) (l x w x h, ft)	Power Consumption (kw)
CB100	100	10 to 30	25,000	5 X 5	1	10 X 7 X 10	1.1
CB200	200	30 to 60	50,000	5 X 5	2	16 X 7 X 10	2
CB300	300	50 to 90	75,000	5 X 5	3	21 X 7 X 10	3
CB400	400	70 to 120	100,000	6 X 6	3	24 X 8 X 10	4
CB500	500	80 to 130	125,000	5 X 5	4	26 X 7 X 12	4
CB750	750	100 to 150	200,000	6 X 6	4	30 X 8 X 12	5.5
CB1000	1000	140 to 200	250,000	7 X 7	4	35 X 10 X 12	7.5
CB1500	1500	200 to 300	375,000	6 X 6	2 X 4	30 X 16 X 12	11
CB2000	2000	280 to 425	500,000	7 X 7	2 X 4	35 X 22 X 12	15.0

NOTE: Final clarifier and pretreatment are not included in the footprint.

**Available in your area from:**



**410-238-7977 • saf@PWTech.us • www.PWTech.us**