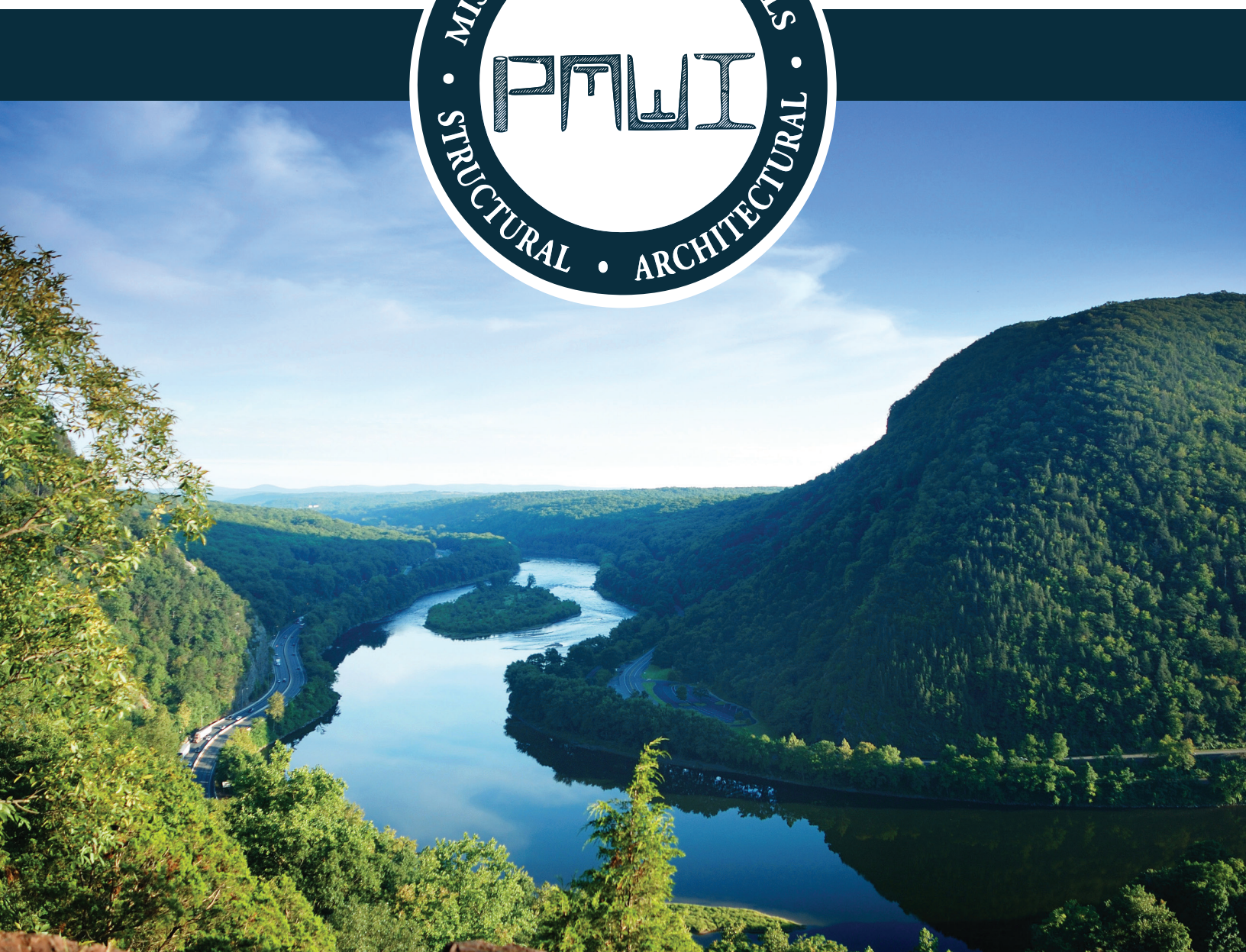
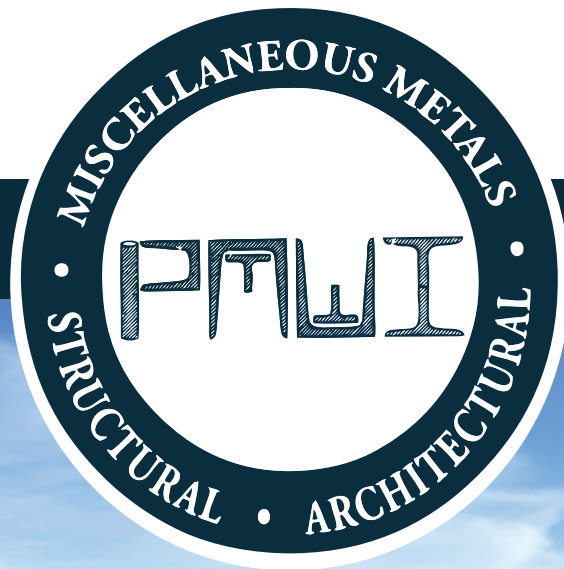


ENVIRONMENTAL EQUIPMENT DIVISION

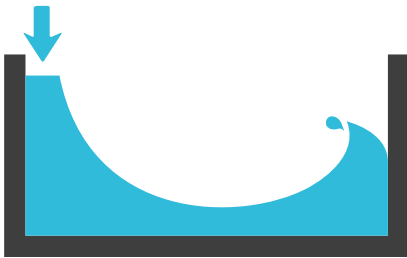
PROVIDING SEQUENCING BATCH REACTORS (SBRs)



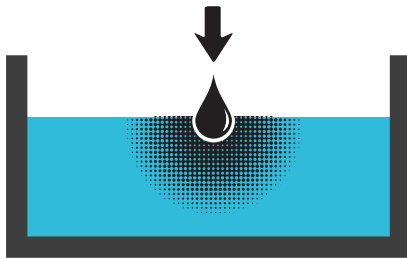
SBR PROCESS

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 time for each step may be easily adjusted in the field to adapt quickly to unexpected change in the 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.

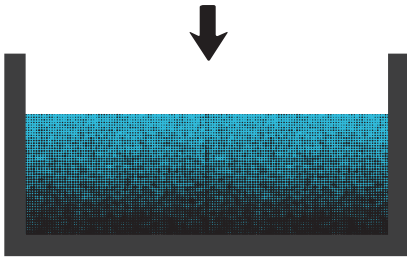
This SBR Process flexibility also guarantees maximum effectiveness in advance wastewater treatment, i.e., the biological removal of nitrogen and phosphorous. The key to this cost-effective method of nutrient removal is the inherent ability of the SBR system to easily provide anaerobic, anoxic, and aerobic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



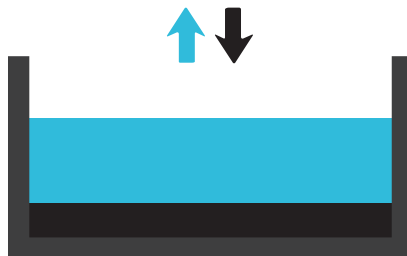
FILL: The fill period begins with a certain amount of mixed liquor in the reactor. This provides the necessary micro-organisms to initiate biodegradation. During fill, wastewater is introduced at a given rate via gravity or pumps, then mixed, and for a period of time, aerated. The fill period can be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



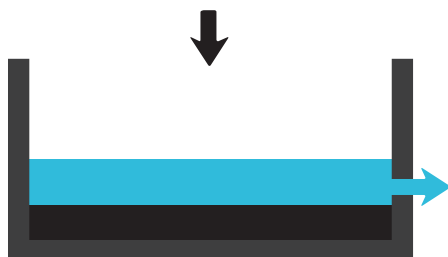
REACT: Treatment begun during the fill period is continued under controlled conditions in the react phase to remove the required nutrients, i.e., carbon, nitrogen, and phosphorous. The treatment control is air, either on or off, to produce anaerobic, anoxic, or aerobic conditions. Controlling the time 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: The purpose of the decant period is to remove the treated clarified supernatant without disturbing the mixed liquor blanket. A trouble-free decant mechanism is used on PMWI SBR's system. The decant phase does not begin until the sludge blanket settles to prevent mixed liquor solids from being drawn into the intake pipe. The decant period should be as short as practical, usually no more than 1 to 2 hours. Extending the decant period for 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 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.

PROJECTS



AWARD-WINNING FIRSTS

Elmhurst Township Sewer Authority (ETSA), Elmhurst, PA was the first SBR designed by David D. Klepadlo, P.E. on the East Coast in 1985. This system was unique in that the collection system utilized septic tank effluent, which was then treated by a new 120,000 gpd SBR WWTP. As the first SBR in the Eastern US, it was viewed by many consulting engineering firms as a proving ground for the SBRs performance in the colder temperatures. Ultimately, it performed better than expected and received an Innovative/Alternative Technology Award from the US Environmental Protection Agency for Energy Savings.



TOTAL NITROGEN & NH₃-N REMOVAL

Greenfield Township Sewer Authority (GTSA), Greenfield Township, PA system utilizes a low-pressure wastewater collection system which is then treated by a 140,000 gpd SBR. Built in 1989, the SBR has consistently met stringent NH₃-N effluent discharge levels of less than 3 mg/l for over 25 years. By eliminating final clarifiers with return and waste sludge equipment, the GTSA saved over \$2 million in project construction costs.



MEETS CHESAPEAKE BAY BNR

Benton-Nicholson Joint Sewer Authority (BNJSA), Nicholson, PA is also a 140,000 gpd SBR. It was monitored for 2 years for compliance with the total nitrogen discharge limits set by the Chesapeake Bay Biological Nutrient Removal requirements. This WWTP met or exceeded these limits without any chemical addition. The BNJSA saved over \$1 million by not having to construct clarifiers and related equipment.



MODULAR/COMPACT DESIGN

Mehoopany WWTP, Mehoopany, PA. SBRs are ideal for close quarters where site constraints, coupled with stringent Chesapeake Bay Biological Nutrient Removal are required. This 50,000 gpd SBR met both these criteria while saving the township over \$1 million in conventional WWTP construction costs.

BUDGETARY COST COMPARISONS OF CONVENTIONAL WWTP VS. SBR

The SBR typically eliminates the need for separate primary and secondary clarifiers in most municipal systems, which reduces construction costs and the operations and maintenance costs associated with these systems. Conventional biological nutrient removal systems require, anoxic basins, anoxic zone mixers, toxic basins, toxic basin aeration equipment, internal MLSS nitrate-nitrogen recirculation and RAS pumps. With the SBR, this can be accomplished in one reactor using aeration/mixing equipment, which will minimize operation and maintenance requirements otherwise needed for clarifiers and pumps.

DESIGN FLOW (GPD)	CONVENTIONAL WWTP	SBR NEW	SBR RETROFIT*
25,000	\$200,000	\$100,000	\$50,000
50,000	\$400,000	\$200,000	\$100,000
100,000	\$1,000,000	\$500,000	\$300,000
200,000	\$2,000,000	\$1,000,000	\$600,000
400,000	\$4,000,000	\$2,000,000	\$1,000,000

*Retrofits assume existing tankage can be converted to SBRs



We are proud to announce our Environmental Equipment Division.

PMWI has been serving the Fabricated Metals Market since 1983.

We are the Largest Manufacturer of Miscellaneous Metals for
Water and Wastewater Facilities on the East Coast.

Headed by David Klepadlo, P.E., who in 1985 designed the first SBR on the east coast for the Elmhurst Township Sewer Authority, Elmhurst, PA., winning an Environmental Protection Agency's, Innovative & Alternative Technology Award for Energy Savings at the Wastewater Treatment Plant (WWTP). Complementing this design with the numerous technological improvements over the past 30 years, PMWI's SBRs provides state-of-the-art, proven modern wastewater treatment for municipal, commercial and industrial wastewater flows.

PMWI's systems come complete with fabricated structural steel tankage, blowers, controls, pumps and any additional equipment required to meet your specific treatment requirements. PMWI's modular systems are prefabricated to allow for ease of installation based on your specific treatment and site requirements.

PMWI custom designs each SBR based on the customer's requirements for treatment. These SBRs provide an economical wastewater treatment system, reducing energy requirements and the necessity of the addition of chemicals over conventional treatment systems. With their capabilities of nitrogen and phosphorous removals they are ideal for building new or retrofitting older communities WWTPs for complying with the Chesapeake Bay Biological Removal requirements.