

GROWING GREENER INNOVATIVE TECHNOLOGY GRANT

FINAL REPORT for SUNBURY MUNICIPAL AUTHORITY ME # 351032

Project Summary:

After completion of the planning, design, and bidding phases, the Municipal Authority of the City of Sunbury (SMA) Board initiated construction on a \$22 million wastewater treatment facility expansion project.

The construction phase began in September, 2001 and the new facility was dedicated in October, 2003

Project components included a new head works facility, a one million gallon Equalization basin, three (3) aeration basins, a **biological nutrient removal (BNR) component**, two (2) clarifiers, and Ultra Violet disinfection.

Bio-solids treatment includes a gravity belt thickener, two (2) aerobic digesters, an aerated holding / storage tank, and a belt filter press.

The upgrade / expansion increases design flows from 3.5 mgd to 4.2 mgd. Influent BOD₅ loadings were increased from 5,838 lbs./day to 12,110 lbs./day.

Wastewater Characteristics and Flows:

The SMA Wastewater Treatment Plant is authorized to discharge treated effluent to Shamokin Creek under NPDES Permit # PA0026557. Effluent Limitations are:

- BOD₅; 25mg/L average monthly & 40 mg/L average weekly
- TSS; 30 mg/L average monthly & 45 mg/L average weekly
- pH range; 6.0 to 9.0
- CL₂ residual; 0.5mg/L average monthly
- Phosphorus & Nitrogen; report only

Average hydraulic daily flows to the treatment plant normally range from 2.8 to 3.3 mgd. Peak flows range from 4.5 to 5 mgd.

Influent BOD₅ typically range from 200 mg/L to 250 mg/L, Influent TSS 160 mg/L to 220 mg/L, Influent pH 6.8 to 7.0

Effluent BOD₅ typically range from 8 to 15 mg/L, Effluent TSS 10 to 18 mg/L.

Effluent pH ranges from 6.8 to 7.0.

The NPDES discharge limits on Fecal Coliform counts are tiered, with a limit of 200/100ml from May 1st to September 30th and a limit of 2000/100ml from October 1st to April 30th. Effluent fecal coliform counts are generally well below the permit limits.

Site Description:

- **History**

The wastewater treatment facility is located at South Fourth Street and Fawn Lane. It is owned and operated by the Municipal Authority of the City of Sunbury (SMA).

The original plant was constructed in 1952. The treatment process consisted of primary clarifiers, anaerobic digesters and chlorine disinfection.

In 1974 a major upgrade was completed. The process was converted to an activated sludge process. Two new aeration basins were constructed and the primary clarifiers were converted to secondary clarifiers. A gravity thickener tank was also constructed to thicken waste before the anaerobic digesters.

- **Process Components (BNR)**

The original aeration basins were both rehabbed as part of the 2001 upgrade. The first tank was equipped with two (2) submersible mixers with no air being introduced. This tank will act as the anoxic zone. All return / recycle flows enter this tank and are mixed without the addition of O₂. Due to the low levels of O₂, ORP meters were installed to monitor the conditions within the reactor.

- **Process Flow Schematic and Pictures**

SEE ATTACHMENT

Innovative Technology Description

The Biological Nutrient Removal (BNR) component was included in the treatment plant upgrade in an attempt to remove as much nitrogen as possible in the treatment of waste water.

The BNR process utilizes a Ludzack-Ettinger system. The BNR is comprised of one (1) anoxic tank equipped with two(2) heavy duty submersible mixers and three aeration tanks that are equipped with fine bubble diffused air. Each of the four (4) tanks is 56' wide X 116' long X 14' side water depth.

The system provides an average 16 hours hydraulic retention @ 4.2 MGD (design flow) with all four (4) tanks in service.

The BNR is designed to treat a peak BOD₅ loading of 14000 lb/day and a peak NH₃-N loading of 875 lb/day.

Settled activated sludge from the clarifiers is constantly returned to the anoxic zone and subsequently to the fine bubble diffused aeration tanks to maintain the DO in the mixed liquor in the range of 0.5 to 3.0. The amount of diffused air is monitored by O₂ sensors located in each aeration tank. The number of diffusers vary in each tank with the first tank after the anoxic zone receiving the most air. The oxidation-reduction potential (ORP) level in the anoxic zone is maintained in the range of 0 to -150 mV.

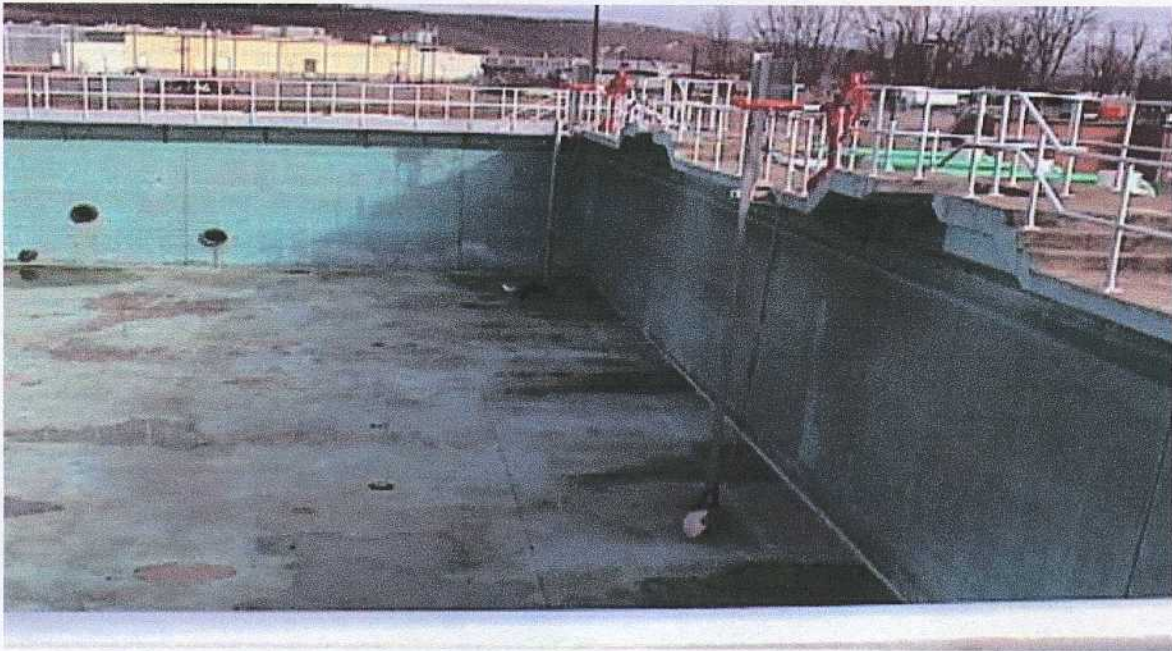
Innovative Technology Description (continued)

The benefits of removing additional nutrients in the treatment process creates an effluent that will have less impact on the receiving stream(Shamokin Creek & the Susquehanna River) and ultimately less impact on the Chesapeake Bay.

While this treatment plant does not have nutrient limits at the present time (report only, twice monthly), it is only a matter of time until nutrient limits will become part of the NPDES permit. To this end, SMA decided to pursue the BNR component while in the midst of a major upgrade / expansion.

COST

As stated earlier in this report, the total cost of the treatment plant upgrade / expansion was about \$21.5 to \$22 million. The BNR portion of the project, which included rehabbing the tank, adding mixers, enlarging the RAS feed, enlarging the RAS pumps to facilitate higher return flows, as well as, additional instrumentation to monitor the anoxic zone (ORP meters), accounted for approximately \$350,000 to 500,000 in costs directly related to BNR.



Empty BNR reactor showing mixers and lifting hoists for servicing units. Pipe openings are return and raw.



Original aeration basin converted to a BNR unit.