

MBR

MBR retrofit in pre-fabricated building allows uninterrupted operation of plant during commissioning and promotes denitrification

APPLICATION: Municipal Wastewater

CAPACITY: 80,000 GPD

LOCATION: Princeton, New Jersey, USA

COMMISSIONED: Spring 2018

BACKGROUND

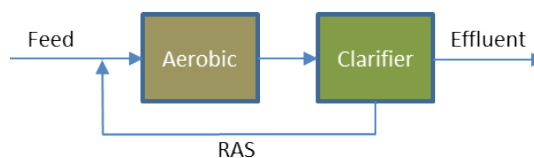
The Educational Testing Service (ETS) collaborates with government, businesses and academic institutions to conduct research to improve educational assessments including management of the nation's SATs. The ETS campus near Princeton, NJ includes offices, boardrooms, a conference center and hotel. This infrastructure was serviced by an ageing WWTP in need of upgrades. In addition, the effluent from the WWTP is sent to a trout stream and a more stringent discharge requirement was given to improve the effluent quality of the plant. The existing WWTP included a conventional activated sludge system with an aerobic bioreactor and clarifier. To address this, a membrane bioreactor (MBR) retrofit of the WWTP was proposed.

SOLUTION

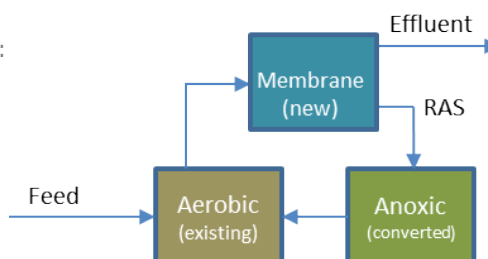
THE FOLLOWING IMPROVEMENTS WERE INCLUDED IN THIS RETROFIT DESIGN:

- Increase in treatment capacity to accommodate the growth of the ETS campus
- Improvement of treatment plant design to provide denitrification
- Retrofit of plant without interrupting operation during construction
- Provide upgrade within the footprint of the existing treatment plant

BEFORE RETROFIT:



AFTER RETROFIT:



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MEMBRANE SPECIFICATIONS

MBR technology was chosen to meet these design requirements. As shown in the above process flow diagrams, the existing rectangular clarifiers were converted to anoxic bioreactors. Flow of mixed liquor was reversed and is now sent to the pre-existing aerobic zones. The mixed liquor is pumped to above-grade stainless steel membrane tanks and a return activated sludge (RAS) stream overflows back to the converted anoxic zones.

To expedite onsite installation and simplify the execution of this project, H₂O Innovation provided a pre-engineered, pre-fabricated equipment building. The building arrived to site on a truck with all pumps, blowers, valves, instruments and control panels pre-installed. The equipment was fully plumbed and all electrical wiring was completed so that the onsite installation effort was limited to interconnecting plumbing between the building and the process tanks.

The project was commissioned in two phases to allow the plant to continuously treat incoming wastewater. One train was retrofitted into an MBR while the other continued to operate as a conventional activated sludge system. Since the existing plant had been operating as a conventional activated sludge system, seeding of the MBR was expedited. After operation of the initial MBR train for two weeks, the second conventional train was taken offline and retrofitted. Since most of the commissioning had already occurred, the second MBR train was commissioned, seeded and started up very quickly, treating wastewater to effluent specifications within 24 hours.

Despite the significant challenges associated with operating the wastewater treatment plant while construction activities continued onsite, the start-up of the ETS MBR treatment plant was very successful. The use of a pre-fabricated building with the equipment installed ahead of time saved months of onsite construction effort.

RESULTS

The plant was commissioned through May and June of 2018 and has been producing excellent effluent quality as shown in the table shown on the left from August 2018:

MBR technology provides excellent wastewater treatment and is particularly well-suited for retrofits of existing treatment facilities. MBR retrofits can provide increased capacity within the same footprint, removal of phosphorus and nitrogen and improve removal of BOD and TSS.

Parameter	Effluent
BOD, mg/L	non-detect
TSS, mg/L	non-detect
TP, mg/L	0.15
NH ₃ , mg/L	0.23
Fecal Coliforms, cfu/100ml	non-detect
E. Coli, cfu/100ml	non-detect