

Team 5: Phosphorus Removal Upgrade at Vernon, CT Water Pollution Control Facility

Sponsored by: Vernon, CT Water Pollution Control Facility

Sponsor Advisor: Steve Boske



William Grant, Caitlin O'Brien, Brandon Holland, and Jacob Ducharme

The Town of Vernon Water Pollution Control Facility services five surrounding areas including the Towns of Vernon, Tolland, Ellington, Manchester, and South Windsor. The design flow is 7.1 MGD, however the plant averages about 3.9MGD. Treated effluent water is discharged into the Hockanum River located to the east of the plant. In the past, the plant treated industrial wastewater from various industries including a textile dye house, currently not in operation, and was the main driving force for the implementation of the now 40-year old Zimpro-PACT secondary treatment system. This process includes the addition of powdered activated carbon to the activated sludge tanks followed by regeneration through oxidation in the wet air oxidizer (WAO) unit located on the site. The Zimpro-PACT system is special in that it provides odor control which benefits residential and commercial areas surrounding the plant. However, the Zimpro-PACT system does not allow for efficient phosphorus removal. Under a new Municipal National Pollutant Discharge Elimination System (NPDES) permit, the plant is required to treat for phosphorus to a seasonal average of 0.14 mg/L in its effluent, which they must meet within five years. The plant is also currently purchasing nitrogen credits due to excessive nitrogen concentrations in their effluent.

Two methods of phosphorus removal have been considered in order to comply with the NPDES permit. This includes tertiary chemical addition and sedimentation as well as enhanced biological phosphorus removal (EBPR). Our EBPR design would replace the existing activated sludge tanks, thus also removing the PACT system; which would bypass many problems that arise with the corrosion of the wet air oxidizer by chemical coagulants. Typically, lower levels of phosphorus effluent can be achieved through EBPR alone, however lowest levels are achieved via a combination of processes. In order to reach an effluent phosphorus concentration as indicated in the NPDES permit, a tertiary polishing step is needed in order to further reduce phosphorus concentrations. Determination of our final design takes into consideration sizing constraints, budget, removal efficiency, current infrastructure, as well as potential for nitrogen removal.

