

## CASE STUDY

DynaSand® and Biolac® - Laurel, DE



# Low Cost Biological System Meets Regulations for the Chesapeake Bay

## Overview

The Town of Laurel is located in Sussex County in southwest Delaware. The town of approximately 4,000 people is mostly residential and situated between Seaford, DE and Salisbury, MD. Prior to the upgrade, the town utilized a 0.5 MGD lagoon treatment system for their wastewater. Effluent from the treatment facility discharges into Broad Creek, which is a tributary of the Nanticoke River and then to the Chesapeake Bay.

## Challenge

In order to reduce nutrient discharges into the Chesapeake Bay, wastewater treatment plants of significant size surrounding it have been charged with upgrading their facilities with established Enhanced Nutrient Removal (ENR) systems. The Chesapeake Bay is the largest tributary in the US and has a significant problem with nitrogen and

phosphorous. There has been an ongoing and increasing effort to reduce nutrient discharge into the Bay since the 1980's.

The Chesapeake 2000 Agreement established ENR limits for wastewater plants discharging into Bay tributaries of 5 mg/L of Total Suspended Solids (TSS), 3 mg/L Total Nitrogen (TN) and 0.3 mg/L Total Phosphorus (TP).

## Solution

In order to improve effluent quality to protect the Bay and add capacity for growth, the town planned an upgrade to a 0.7 MGD ENR compliant plant with capacity to process 21,000 gpd of screened septage. George, Miles & Buhr (GMB) Engineers in Salisbury, MD were tasked with the design of the upgrade of the wastewater treatment facility.

The project was partially funded by the Delaware Water Pollution Control Revolving Fund which is supported by the Delaware Department of Natural Resources and Delaware Division of Water Resources. After consideration of the best solutions, including extended aeration and oxidation ditches, the project was designed and bid based around Parkson Corporation's Biolac® Wastewater Treatment System and DynaSand® Filter technology.

The Biolac® system is an innovative activated sludge process using extended retention of biological solids to create an extremely stable, easily operated system. The capabilities of this technology far exceed ordinary extended aeration treatment, providing superior efficiency. The design ensures the lowest cost construction and guarantees operational simplicity. The DynaSand® Filter, on

## Treatment Plant Performance for May 2009

	BOD mg/l	TSS mg/l	TKN mg/l	TN mg/l	NO3 mg/l	P mg/l
Influent	140	176	65.33	71.06	5.7	7.6
Effluent	6.4	2	0.76	1.75	0.84	0.17
Specification	12	5	N/A	3	N/A	0.3

the other hand, is an upflow, deep bed, granular media filter with continuous backwash. Its internal washing system makes maintenance simple and demands low energy consumption.

Similar performing biological ENR systems in the area have been awarded based on other technologies for over \$16.40 per influent gallon while the system designed around Parkson cost the town only approximately \$11.43 per gallon.

### Biological Nutrient Removal

The secondary process at Laurel is the Parkson Biolac® System with the Wave Oxidation® modification. This extended aeration process (SRT>50 days) includes a BioP zone for initial phosphorus removal. Raw influent and return activated sludge are combined in this zone under anaerobic conditions prior to discharge into a single extended aeration basin.

The extended aeration basin construction is compacted earth with sloped walls and a synthetic liner. The aeration system consists of floating aeration headers (chains) with automated valves. The aeration chains are controlled to

create moving zones of oxic and anoxic conditions within the single basin to facilitate nitrification and denitrification. The movement of the aeration chains also maintains complete mixing of the basin contents at lower airflow rates allowing greater turndown during periods of low loadings.

Integral to the Biolac® extended aeration process are two parallel secondary clarifiers. Excess biological solids are wasted out of the Biolac process and can be pumped to one of the former treatment lagoons due to the high degree of biological stability.

### Enhanced Nutrient Removal

The tertiary treatment step at Laurel encompasses final filtration, denitrification and phosphorous polishing. The treatment system utilizes the Parkson DynaSand® continuous backwash filter along with Parkson's patented ENR control and instrumentation system.

The Parkson ENR control system consists of a multi-parameter, on-line analyzer, a PLC control system and a sampling manifold with instrumentation

to support the process. All measured parameters are monitored by the PLC control system. Readings from the on-line unit and instruments are used by the PLC to optimize chemical feed pumps for both external/supplemental carbon and coagulant.

The final effluent low in nitrogen, phosphorous, BOD and suspended solids is discharged from the filters to UV disinfection. Filter backwash is returned to the head of the plant for reprocessing.

### Results

The plant has been operating since July of 2007. It is currently loaded significantly below the design. The system utilizes the built-in flexibility of the Wave Ox design to manipulate DO levels to optimize nitrification and denitrification. In spite of the significant under loading, the facility is able to produce the specified effluent.

Another important control variable is the online instrumentation readings, which were comparable with the plant laboratory results and required no further calibration. ■



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1.888.PARKSON  
[technology@parkson.com](mailto:technology@parkson.com)  
[www.parkson.com](http://www.parkson.com)