A COMMERCIAL APPLICATION OF VIROSEWAGE™ TECHNOLOGY

CASE STUDY: SHANDON LAGOON, SOUTH CAROLINA, USA

"ViroSewage™ Technology is a simple, low cost Technology for treating wastewater to lower phosphorous concentrations... A remedial goal of <2.0 mg/L of orthophosphate-P was the project target. Post-treatment results showed concentrations of 0.10 mg/L and 0.66 mg/L of orthophosphate-P at the Lagoon #1 outflow..."

Lagoon before and after treatment using ViroSewage™ Technology

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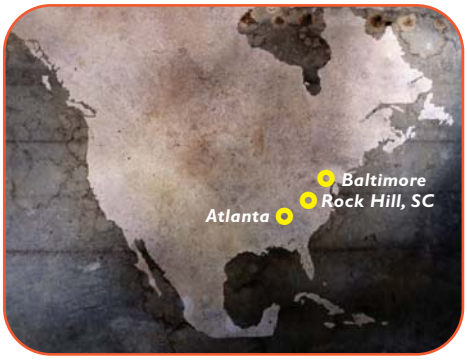

Shandon's Lagoon wastewater treatment plant is located in South Carolina, USA.

PROBLEM

Shandon's Lagoon is a wastewater treatment plant is operated by Carolina Water, and owned by the municipality of Rock Hill, South Carolina.

The operation was having problems meeting discharge limits for phosphorous. As a result, ViroSewage™ Technology was trialed to lower the phosphorous concentration in the treated waste water.

VIROTEC TOTAL SOLUTION

The ViroSewage™ Technology application was successful in treating the wastewater to comply with the discharge limits for phosphorous. Treated water properties had improved significantly in that colour, clarity, turbidity and phosphorous content were substantially improved after installation of ViroSewage™ Technology.

The facility has two lagoons each with an approximate capacity of 1 ML.

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The ViroSewage™ Technology reagents were applied in slurry form to Lagoon #1. Depending on theapplication ViroSewage™ Technology reagents in powder or pellet form can also be used.

BACKGROUND

Shandon's Wastewater Treatment Facility includes two lagoons, an aerated lagoon (Lagoon#1), and a polishing pond (Lagoon #2) with an approximate capacity of 1 ML each. The average daily flow rate is 32,000 L.

The operator, Carolina Water reported an effluent concentration (at the discharge from Lagoon #2) for orthophosphate-P of 2.5 mg/L, which exceeded the regulatory limit of 2.0 mg/L, and a pH of 7.4.

The focus of this remedial program was to reduce orthophosphate-P concentration below the regulatory levels for the target lagoon, Lagoon #1.

TREATMENT METHODS

Remedial phosphate treatment was carried out in two stages. Both pH and orthophosphate-P analyses were performed pre and post-treatment, by Virotec AquaSolve and Shealy Environmental. Further analyses were performed by Virotec AquaSolve following the second stage of treatment. All samples were taken from three previously designated sample points; the influent side of Lagoon #1, the middle discharge (outflow) of Lagoon #1, and the final discharge outflow from Lagoon #2.

Treatment of Lagoon #1 using ViroSewage™ Technology Reagents.

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RESULTS

Tables I and II present the results of the treatment at various times, and the orthophosphate-P concentrations over the treatment period are presented in Figure 1.

Table I – Baseline, Interim and Post Treatment Results.

	Influent, Lagoon 1		Outflow, Lagoon 1		Lagoon 2	
Sample Date	pH, s.u.	P#, mg/L	pH, s.u.	P#, mg/L	pH, s.u.	P#, mg/L
March 1, 2006[2]	9.14	10.00	9.08	4.00	7.38	4.33
March 1, 2006[2]		0.90		0.10		*
March 2, 2006	8.60	13.33	9.10	4.00	7.13	2.66
March 3, 2006[1]	7.95	2.00	7.03	2.66	8.88	2.33
March 3, 2006[2]		2.00		0.66		*

[1] Pretreatment
[2] Post-treatment
* Note: no post-treatment value is reported for Lagoon #2 because about one month is required to replace the water in Lagoon #2 (inflow of 32 kL/day into 1 ML)
# P values represent orthophosphate-P

TABLE II – Follow-up Treatment Results

	Influent, Lagoon 1		Outflow, Lagoon 1		Lagoon 2	
Sample Date	pH, s.u.	P#, mg/L	pH, s.u.	P#, mg/L	pH, s.u.	P#, mg/L
March 20, 2006	8.98	0.35	8.71	0.43	6.95	0.75
April 3, 2006	8.11	0.71	8.34	0.76	6.65	0.50
April 20, 2006	7.08	0.25	8.31	0.60	7.12	0.15
May 3, 2006	7.10	0.30	8.39	0.23	6.51	0.12
May 17, 2006	7.06	1.20	7.70	0.46	6.40	0.29

Note: the treatment was applied only to lagoon #1, consequently, it would take at least one month for the effect of the treatment to be fully expensed in Lagoon #2 because the inflow to Lagoon #2 is about 32 kL/day and the holding capacity is about 1000 kL. The effect of the continuous inflow of treated water to Lagoon #2 is evident in the progressive improvement in Lagoon #2 discharge water quality from March 1, 2006 (Table I) to May 3, 2006 (Table II).
P values represent orthophosphate-P

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Treatment of Lagoon #1 using ViroSewage™ Technology Reagents. The coloured reagent settled to the bottom of a treated water body within 48 hours.

The initial treatment of ViroSewage™ Technology resulted in a rapid decrease in orthophosphate-P concentrations to well below the regulatory limits. However, the low phosphate water produced, resulted in high phosphate concentration gradients across the sediment/water interface and caused substantial repartitioning of phosphate from the sediment and pore waters to the overlying lagoon water. Consequently, a second treatment was required to remove the phosphate released from the sediment. The second treatment mopped up the released phosphate, decoupled the sediment and the water, and resulted in phosphate concentrations in the lagoon water rapidly falling below, and remaining below, regulatory limits.

Because the phosphate concentrations in the sludge/sediment may commonly be several thousand times higher than concentrations in the overlying water, the results of this treatment show that labile phosphate loads in the sediment must be taken into account when planning treatment for lagoon waters.

A remedial goal of <2.0 mg/L of orthophosphate-P was the project target. Post-treatment results showed concentrations of 0.10 mg/L and 0.66 mg/L of orthophosphate-P at the Lagoon #1 outflow. Follow-up orthophosphate-P analyses showed concentrations of 0.46 mg/L despite continual inflow of phosphate-bearing water and no further treatment.

Although Lagoon #2 was not treated, reductions in orthophosphate-P concentrations were noted. Concentrations decreased from the baseline value of 4.33 mg/L to 2.66 mg/L. Concentrations in Lagoon #2 have continued to decrease (Table II) as low phosphate water from the treated Lagoon #1 has progressively diluted the originally high phosphate water in Lagoon #2.

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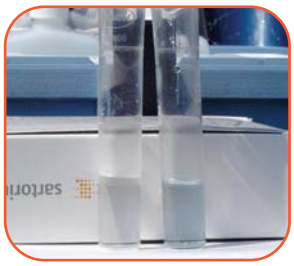

Samples showing treated and untreated water.

CONCLUSION

This case study demonstrates that ViroSewage™ Technology is a simple, low cost technology for treating waste water to lower phosphorous concentrations.

The longer the residue from ViroSewage™ Technology treatment is left to age after application, the more tightly the phosphate is held, and new trapping capacity develops. However, phosphate loading is continual and fluctuates daily at the Shandon Lagoon, as indicated by the four separate sampling events, and will require a maintenance program to ensure that the regulatory limits continue to be met.

The concentration of orthophosphate-P is gradually decreasing in Lagoon #2, as low phosphate water is input from the treated Lagoon #1. In future treatments it would be desirable to apply some treatment to Lagoon #2 to remove existing phosphate and to remove labile phosphorous from the existing sludge bed.

Lagoon #1 after treatment using ViroSewage™ Technology.

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