March 14, 2014

Town of Amherst, MA WWTP

NPDES Permit No. MA0100218

APRIL 1, 2014 NITROGEN REMOVAL REPORT

Nitrogen Removal first appeared on our permit in September 2012 with a limit for an annual average of 546.5 lbs/day TN. The year prior to our current permit (2011-2012) our Total Nitrogen in our discharge was 840 lbs/day (22.4 mg/l). Successful results of our first year were 534.5 lbs/day (14.5 mg/l). Our goal is to improve upon those numbers each year.

We have made the decision to accomplish nitrogen removal by using instrumentation, process control, SCADA and no chemical addition. We brought on board a nitrogen consultant, Grant Weaver from The Water Planet. He remains under contract until August 31, 2014. Our average daily flow is 4.0 MGD. The Activated Sludge Process has 9 (nine) mechanical Aerators and 1.872 MG of Aeration Basin volume.

Seven of the nine Aerators have dedicated Hach ORP and DO probes. This data is fed to the SCADA System which in turns gives us live analog data and trend charts. A program was written to allow the operator control of DO set points, Aerator speeds and on and off Aerator cycles. As microorganisms, food wastes and NH3-N flow thru the Aeration Process, this continuous plug flow encounter Aerobic and Anoxic zones to convert Ammonia Nitrogen to Nitrogen gas.

Amherst being a college town presents many challenges with nitrogen removal. Loadings such as flows, BOD and nitrogen change every weekend, holiday, semester break and summer. As we amass more and more seasonal data we utilize the good quality control results and apply it to the following year. For weekly permit reporting of nitrogen data we collect a 24 hour composite sample beginning on Wednesdays and perform the testing on Thursdays. Our lab performs daily week day testing for NH3-N, NO2-N, NO3-N and pH for process control. Twice/week testing is performed for Alkalinity and TKN.

- F/M Range : 0.12 - 0.15
- MCRT Range : 14 - 16 days
- DO set point : 2.0 ppm
- Aerobic "ON" Cycles Range : 70 - 180 minutes
- Anoxic "OFF" Cycles Range : 60 - 135 minutes
- 9 Aerators On-line : High loadings - 8 months of the year
- 6 Aerators On-line : Lower loadings - 4 months of the year

We were utilizing two ½ HP, 110V submersible pumps that returned some Aeration outfall back to the inlet box of Aeration to attempt to recycle some Nitrates. At the time we used the 110V service that was available and two smaller pumps that produced a flow of approximately 70-100 gpm each. One of these pumps stopped working and we are down to one presently operating. We have since installed 6 inch PVC piping and valves and are presently pulling wire for a 480V service to feed two 5 HP submersible pumps, each capable of doing 600-800 gpm. One pump will be up and running at the end of March 2014 and the second installation is targeted for Sept 2014.

Running additional Mechanical Aerators has resulted in approximately $8,000 more in annual electrical costs. However, running longer sludge ages has saved us money by producing less dry tons of biosolids. 2012 produced 54 less dry tons than in 2011 resulting in a $13,000 savings and in 2013 the total dropped an additional 19 dry tons for another $5,000 savings (Note: Disposal costs went up in 2013 with a new contract).

We find that Nitrogen removal makes for an interesting operation challenge with the variables that the Amherst Wastewater Facility presents. Our goal remains to continue to reduce Total Nitrogen for the least amount of cost.

Sincerely

Jim Laford

Amherst Wastewater Division Director

Amherst Effluent Nitrogen Data

MONTHLY AVERAGE

Amherst WWTP Laboratory

Month	Ammonia mg/L		Nitrite mg/L		Nitrate mg/L		TKN mg/L		Total N mg/L		Lbs./Day of N	
	2012/ 2013	2013/ 2014	2012/ 2013	2013/ 2014	2012/ 2013	2013/ 2014	2012/ 2013	2013/ 2014	2012/ 2013	2013/ 2014	2012/ 2013	2013/ 2014
September	22.3	12.6	0.3	0.4	3.2	3.6	23.7	15.3	27.9	19.1	1040.9	591.9
October	18.7	13.9	0.3	0.3	2.8	5.5	20.7	16.6	24.3	22.3	945.7	674.8
November	11.5	8.5	2.1	0.3	3.5	7.7	16.1	11.0	20.9	18.6	739.2	556.0
December	3.5	4.3	2.2	0.2	3.7	6.5	6.9	6.3	12.7	12.8	433.3	389.5
January	6.5	8.3	3.0	0.2	2.7	4.0	10.5	10.8	16.2	14.8	570.0	513.8
February	2.9	11.3	4.8	0.2	3.9	6.0	8.7	14.7	17.3	20.9	714.6	687.2
March	3.8		1.9		4.0		6.8		12.6		556.7	
April	10.3		0.5		1.9		13.3		15.7		568.7	
May	2.9		0.7		1.2		4.2		6.2		185.0	
June	3.1		0.3		1.0		4.4		5.8		232.5	
July	4.1		0.2		2.2		5.2		7.3		219.8	
August	3.8		0.3		3.2		5.2		8.6		207.0	
Annual	7.8		1.4		2.8		10.5		14.6		534.5	

Nitrogen Testing Laboratories 2013/2014

Contract Labs:

2013

Spectrum Analytical Inc.
11 Herbert P Almgren Dr., Agawam, MA 01001
Phone: (413) 789-9018

For the year 2013 Spectrum Analytical performed weekly nitrogen testing for Total Nitrogen, TKN and Nitrate. The Amherst WWTF laboratory analyzed Ammonia-Nitrogen and Nitrite using the current methods listed below. Spectrum used EPA Method 300.0 for Nitrate and Standard Method 4500-NH3 C for TKN. Total Nitrogen was done by calculation adding up the other nitrogen test results.

2014

Premier Laboratory
Microbac Laboratories, Inc.
61 Louisa Viens Dr., Dayville, CT 06241
Phone: (800) 334-0103

In 2014 contract lab Premier ran nitrogen tests on composite samples on January 2nd and January 9th. Premier used EPA Method 351.1 for TKN and for Nitrate and Nitrite Standard Methods 4500-NO_3 F. Total Nitrogen was done by calculation adding up the other nitrogen test results.

Amherst WWTF Laboratory
100 Mullins Way, Hadley MA 01035
Phone: (413) 259-3055

Permission for the Amherst Wastewater Treatment Facility Laboratory to analyze TKN in wastewater for reporting using the Hach Method 10242 was granted by EPA and MassDEP. EPA's approval letter, dated January 16, 2014, is on file in the laboratory. Relevant correspondence from MassDEP is also in the file.

Permission to analyze NO_3 in wastewater for reporting using the Hach Method 10206 was also approved by EPA and MassDEP. This method is equivalent or better in performance to SM 4500-NO3- E, and EPA 353.2 for the purposes of regulatory reporting of nitrate and nitrate-nitrite. From January 16, 2014 to the present our Amherst WWTF laboratory is performing all nitrogen testing in house for reporting.

Current Nitrogen Tests and Methods

TKN: Hach Method 10242, s-TKN Simplified Spectrophotometric Measurement
Ammonia-Nitrogen: Hach Method 10205, Salicylate Method
Nitrate: Hach Method 10206, Dimethylphenol Method
Nitrite: Hach Method 10207, Diazotization Method
Total Nitrogen: calculated by adding TKN, NO_2 and NO_3 results