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Live Pilot Program Results: Phosphate Reduction using the Water Life Systems *PureBOX™* Equipped for Nutrient Processing, at the Dale Sanitary District #1 Wastewater Treatment Plant

Opening:

Water Life Systems Inc (WLS), in agreement with the Township of Dale, Wisconsin (Dale), performed a study of the WLS PureBOX™ nutrient processing system. This system was specifically designed for removal of phosphorus (P) and bacteria from wastewaters. In this application the Pilot was demonstrated for use in end-of-pipe-effluent of municipal wastewater treatment plant applications. The target was to bring the phosphorous levels down to below the regulations set forth by the Wisconsin Department of Natural Resources (WiDNR).

WLS designs and manufactures modular ISO 30500/33003 spec wastewater treatment and monitoring systems, among others, to clean groundwater, surface water, and wastewater to

any predefined quality. WLS has proprietary water sensor monitoring systems to provide live up-to-date toxin level, and other qualitative and quantitative, information.

Dale approached WLS as a new, USA-based, water technology company offering innovative technology solutions. After three years of research and development, WLS was ready to offer environmental service technology to solve water quality problems, transforming toxin polluted water into clean, reusable water. Dale began the process of gathering information on technologies to meet their phosphorous requirements. Additionally, WLS was asked to reduce bacteria and ammonia levels to assure the system can also reduce these contaminants.

Bacteria treatment is an automatic byproduct of the PureBOX™ systems, and tests show these contaminants are brought down to safe levels for discharge into the ecosystem or water reuse. The Township also was interested in WLS's proprietary sensors and monitoring components that measure the water contamination levels before and after the treatment process.

Note: WLS has monitoring intelligent sensors that can report the contamination levels of many toxins before and after the processing and report those results live back to the cloud for analysis. Additionally, The PureBOX™ system can be used in closed loop applications to process waters for immediate reuse. Such applications may include remote sanitary bathrooms, agricultural operations such as hydroponics, aquaculture, and similar industrial applications. The system is scalable to larger systems to accommodate a client's needs for reusing scarce water resources and nutrients. The closed loop system has little water loss except the naturally occurring evaporation and low energy demand

The closed loop feature described above was not asked for in the Dale Pilot and therefore not put into the modular design.

Problem and Reason for Pilot Program

The Township of Dale is in East Central Wisconsin. Approximately 600 people reside there within 200 households. Dale has a primary treatment plant, the Dale Sanitary District #1, for residential sewage (gray and black water) which is comprised of a 3-stage treatment pond and pumping facility.

Dale's Phosphate (P) levels are significantly higher than WiDNR acceptable levels due mainly to more stringent changes in WiDNR regulations and an aging treatment plant. The Township of Dale is under orders from the WiDNR to reduce their phosphate levels being discharged from their wastewater treatment plant to at or below the required P level or be subject to monetary fines and other actions.

Dale was also discharging unacceptable ammonia (nitrate) levels per WiDNR regulations from their wastewater treatment plant. Dale was recently forced spend slightly less than 1 million dollars to install a new treatment component that only addressed the ammonia (nitrate) levels. the Nitrate solution installed does not provide ability to remove other toxins such as phosphate to the WiDNR requirements. Dale was looking for alternative lower cost systems that also will be able to handle not only phosphate but also other contaminates that may become problematic for them in the future as the WiDNR enforces additional water quality regulations.

Dale contacted WLS for alternatives to traditional costly toxin removal processes and we used the opportunity to commercially validate the PureBOX™ in a live field setting outside of the lab environment and so Dale and WLS entered into an agreement to perform a Pilot study of the PureBOX™ system and have the results be independently verified by a WiDNR certified laboratory. Badger Laboratory, which the Township of Dale uses to certify water quality, was selected.

Pilot Objectives and Measurement of Success for the Pilot

The objective of the Pilot was to demonstrate that the PureBOX™ does in fact reduce Dale's wastewater bacteria to safe levels and removes phosphate to levels below the DNR required limits. A secondary objective was to show that the PureBOX™ modular system, can reduce other toxins and heavy metals within the same treatment process, without specifically targeting these toxins. During the Pilot WLS looked at Ammonia Nitrogen (N) and Iron levels before and after processing.

The goal was to verify the system by the completion of testing and production of lab results from the independent laboratory delivered to Dale stakeholders by August 1st, 2020. As required by the Township of Dale, no added chemicals were to be used in the treatment of the water. Competitor systems have proposed using Chlorine or Bromide which also could add more contaminants to the watershed region.

The measurement and level of success for the WLS Dale Pilot was established with Dale with testing to be performed by an independent laboratory. Badger Laboratories of Neenah Wisconsin was selected as a WiDNR certified water testing laboratory which Dale has used in the past for water testing. Success was measured against the required WiDNR maximum levels of P allowed in the end water discharge from the system.

Note: The system had previously been tested for Bacteria count and it proved to be under State of Wisconsin Minimum requirements for safe water.

WiDNR Maximum limits are as follows:

Max WiDNR Phosphate (P) limit is: 0.075mg/Liter

Max WiDNR Ammonia limit is: 0.12mg/Liter

WLS System Installed at the Dale Wastewater Treatment Plant for Pilot Design

The PureBOX™ design for the Pilot, was a scaled down version of the PureBOX™ system that can handle 40,000 gallons of wastewater for treatment in a 24-hr. period. The Pilot PureBOX™ design consisted of a 10ft. x 8ft. insulated container (SeaCan) housing the mechanical system components.

Mechanical components in the SeaCan include:

a. Proprietary in-solution ozonation system.

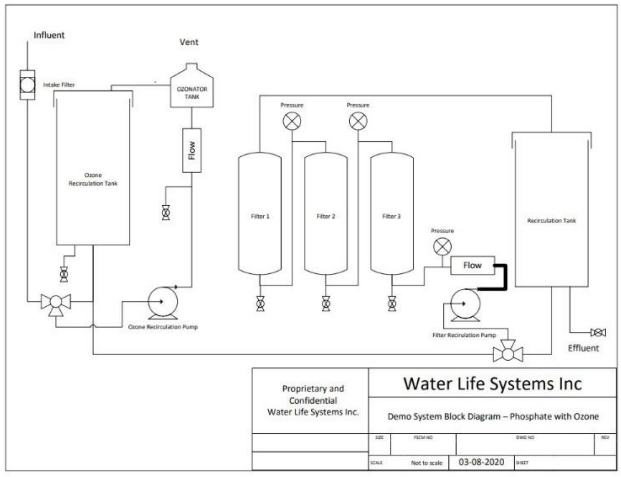
b. Proprietary tubular phosphate filters designed for recovery of phosphate for later reuse.

c. mechanical pumps, valves, and piping

d. storage tanks for water batch processing

e. Electrical systems to drive the mechanical components

d. Sensors for monitoring process conditions and water quality



Above: Dale Pilot site location

Note: The schematic above is for presentation only. The proprietary components of the system within the modules are not shown as they are intellectual property of WLS.

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Testing Process and Procedures for the WLS Pilot

A total of three testing cycles were completed with residential wastewater from Dale. For the first two testing cycles, water was collected and transported to where the PureBOX™ pilot system was being built and tested nearby. The third testing cycle was conducted on site with the PureBOX™ at the Dale Sanitary District #1 treatment facility in the township of Dale.

Test Cycle 1

Test cycle one had two objectives.

1. Test the phosphate filters with known flow rate and exposure time on wastewater from the township.
2. Test the ozone system for the reduction or E Coli, Coliform and ammonia nitrogen reductions.

3. This round of test was conducted with a flow rate of 8gpm. Testing completed was completed James Olejniczak and Jon Loeck. Water was transported to Badger Laboratory.

. *Above: Control sample was collected directly from third pond drainpipe and send to Badger labs. Results:*

labs. Results:

PHOSPHORUS, TOTAL: 4.2 mg/l

E COLI: 152.9 MPN/100ml

TOTAL COLIFORM: >249.6 MPN/100ml

AMMONIA NITROGEN: 13 mg/l

1.) Testing phosphate filters

Water was pumped through three phosphate filters one time.

Sample was taken and sent to Badger Labs, Results:

PHOSPHORUS, TOTAL: 0.09 mg/l

Water was pumped through all three phosphate filters for a second time.

Sample is taken and sent to Badger Labs, Results:

PHOSPHORUS, TOTAL: <0.08 mg/l,

Note: For the first two test cycles, Badger Labs could only show levels as low as 0.08mg/l. For test cycle 3, Badger Labs obtained a low-level phosphorus test. Thus, the terms “Standard” and “Low-Level” are used.

2.) Testing Ozone system

The E. Coli was reduced to <1 and total Coliform was reduced to 12.1 MPN/100ml after three passes in our pilot ozone recirculating system. The total ammonia nitrogen was 13mg/l the control sample. The ammonia nitrogen was reduced to 12 mg/l three passes in the pilot ozone tank.

Notes: Samples from the second and third passes had dark red solid particles on the bottom on the sample. These were tested and found to be iron and other metals which fell out of solution as expected.

Test Cycle 2

Date: 5/14/2020.

Purpose of test: Testing an updated control panel for the ozone system and measuring for E-coli, coliform levels and for ammonia and metal reductions. Phosphate levels are also tested after running through the phosphate filter setup. Again, the water sample was taken to Badger Labs for testing.

Base line or control sample.

Control sample was collected and sent to Badger Labs. Results:

E COLI: 38.4 MPN/100ml

TOTAL COLIFORM: 172.3 MPN/100ml

AMMONIA: 19mg/l

KJELDAHL NITROGEN: 21 mg/l

NITRATE/NITRTIE: 0.41 mg/l

IRON, TOTAL 0.90 mg/l

Water is pumped through the Ozone system one time.

Sample is taken and sent to Badger Labs, Results:

E COLI: 10.8 MPN/100ml, -27.5 MPN/100ml from baseline

TOTAL COLIFORM: 31.8 MPN/100ml, -140.5 MPN/100ml from baseline

AMMONIA: 19mg/l, -0.0 mg/l from baseline

KJELDAHL NITROGEN: 19 mg/l, -2.0 mg/l from baseline.

NITRATE/NITRTIE: 0.51 mg/l, +0.1 mg/L from baseline.

Water is pumped through the Ozone system for a second time.

Sample is taken and sent to Badger Labs, Results:

E COLI :< 1.0 MPN/100ml, -38.4 MPN/100ml from baseline

TOTAL COLIFORM:< 1.0 MPN/100ml, -172.3 MPN/100ml from baseline

IRON, TOTAL: 0.73 mg/l, -1.7 mg/l from baseline

AMMONIA: 16mg/l, -0.3 mg/l from baseline

KJELDAHL NITROGEN: 17 mg/l, -0.2 from baseline

NITRATE/NITRTIE: 0.62 mg/l, +0.11 from baseline

Test Cycle 3

Date: 6/17/2020.

Purpose of test: Testing new system on site at Dale wastewater treatment facility. Evaluate for nitrogen and phosphate reductions.

Testing is completed on site in Dale

Above: Control sample was taken right out of wore, into WLS' PureBOX System before discharge and send to Badger labs. Results:

and sent to Badger Labs. Results:

AMMONIA NITROGEN: 2.7 mg/l

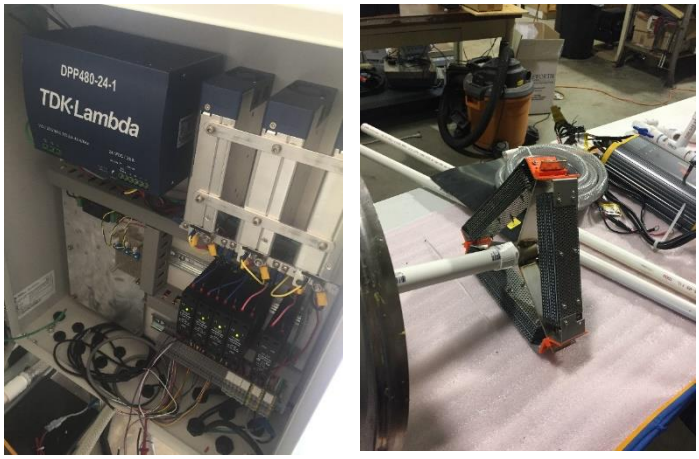
KJELDAHL NITROGEN: 8.0 mg/l

NITRATE/NITRITE N: 4.3 mg/l

NITROGEN, TOTAL: 12.3 mg/l

PHOSPHORUS, TOTAL: 2.9 mg/l

Below: New power section for Ozone elements and element setup.



Water is pumped through the Ozone system one time.

Sample is taken and sent to badger labs, Results:
AMMONIA NITROGEN: 2.0 mg/l, -0.7 mg/l from baseline

KJELDAHL NITROGEN: 6.3 mg/l, -1.7 mg/l from baseline

NITRATE/NITRITE N: 4.7 mg/l, +0.4 mg/l from baseline

NITROGEN, TOTAL: 11 mg/l, -1.7 mg/l from baseline

Water is pumped through the Ozone system second time. Sample is taken and sent to badger labs, Results:

AMMONIA NITROGEN: 1.4 mg/l, -1.3 mg/l from baseline

KJELDAHL NITROGEN: 6.2 mg/l, -1.8 mg/l from baseline

NITRATE/NITRITE N: 4.6 mg/l, +0.3 mg/l from baseline

NITROGEN, TOTAL: 10.8 mg/l, -1.9 mg/l from baseline

PHOSPHORUS, TOTAL: 2.8 mg/l, -0.1 mg/l from baseline

WLS tested the residual effect of the ozonized water. Sample rested for 20 minutes, then we ran ozone system for 1 minute. Sample is taken and sent to Badger labs, Results:

AMMONIA NITROGEN: 1.2 mg/l, -1.5 mg/l from baseline
KJELDAHL NITROGEN: 5.8 mg/l, -2.2 mg/l from baseline

NITRATE/NITRITE N: 4.5 mg/l, +0.2 mg/l from baseline

NITROGEN, TOTAL: 10.3 mg/l, -1.8 mg/l from baseline

Water was transferred to second tank for testing of phosphate filters.

Starting phosphorus level:

PHOSPHORUS, TOTAL: 2.8 mg/l

Water is pumped through all three phosphate filters. Sample is taken and sent to badger labs, Results:

PHOSPHORUS, TOTAL: <0.08 mg/l, Standard test
PHOSPHORUS, TOTAL: <0.01 mg/l, Low-level test

Water is pumped through all three phosphate filters for a second time. Sample is taken and sent to badger labs, Results:

PHOSPHORUS, TOTAL: <0.08 mg/l, Standard test
PHOSPHORUS, TOTAL: <0.01 mg/l, Low-level test

Water is pumped through all three phosphate filters for a third time. Sample is taken and sent to badger labs, Results:

PHOSPHORUS, TOTAL: <0.08 mg/l, Standard test
PHOSPHORUS, TOTAL: <0.01 m1/l, Low-level test

Above: Water samples sent to Badger Laboratory for testing before and during the WLS system processing. Note discoloration to clear.

Results of the WLS *PureBOX™* Wastewater Contaminant Treatment Pilot at Dale

Per the Township of Dale and independent laboratory results, the Dale Pilot was successful test of the WLS system at all levels. The PureBOX™ system cleaned the Dale wastewater to under the WiDNR requirements for Phosphates while eliminating Bacteria as expected. The PureBOX™ also was shown to reduce ammonia and metals without any specific targeting adjustments made by the system to do so.

Summary:

1. WLS system cleaned the phosphate (P) levels from 4.2 mg/l in original sample to <0.08 mg/l in our Standard test and to <0.01m1/l, in final Low-Level testing far below the WiDNR Phosphate (P) limit of 0.075mg/Liter.

2. WLS system cleaned the E Coli from original sample of 152.9 MPN/100mlrom to < 1.0 MPN/100ml in final testing. The system also cleaned COLIFORM from >249.6 MPN/100ml to :< 1.0 MPN/100ml.

3. Even though the system was not calibrated for specific nitrogen limits, AMMONIA NITROGEN was reduced by 55% and TOTAL NITROGEN was reduced by nearly 15%.

4. Even though the system was not calibrated to target heavy metals, WLS system was able to reduce dissolved iron by nearly 19%.

Conclusion

Results of the onsite live Dale Pilot study confirm that the PureBOX™ system by WLS can allow municipalities to meet the state-imposed phosphate limits necessary to meet the requirements of the Clean Water Act. The system further improves watershed ecosystems by removing harmful bacteria and other toxins from the wastewater plant effluent.

The PureBOX™ Dale Pilot also proved the combination of new filtration and ozone generation technology offered in a low cost, portable, and flexible design can be utilized to clean up surface water and ground water contamination on demand without the use of chemical additives.

Dale Sanitary District No. 1 W9611 Wheeler Road Dale, WI 54931

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Wilmington, DE 19803

Attention: Jamie Gordy - President
James Olejniczak - CTO
John Murphy - CFO

On behalf of the Dale Sanitary District I am extending our thanks for your time and resources to demo your Phosphorus System, collect the necessary data, and present your report during our August 18th 2020 meeting. It was very enlightening to see actual processed water data, analyzed at a local accredited lab, detailed in such a way to show system efficiency and effectiveness.

Currently in Dale we are measuring phosphorus levels of 4-5 g/L on average which is above the WIDNR required levels of 0.075 g/L. We are investigating a number of approaches to reduce our phosphorus level to comply with the WIDNR.

We are interested in your scalable emerging technology not only to address elevated levels of phosphorous but also other undesirable water contaminants as the WIDNR continues to regulate effluent to the watershed.

The Dale Sanitary District is looking forward to your participation in the upcoming Phosphorus Project.

Regards,

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Attachments are the Badger Laboratory Certified Results.