NewsLeaks

SUMMER 2018

Vermont Rural Water Association

Vermont Rural Water Association....Supporting Water and Wastewater Systems since 1982

VRWA 2018 Conference and Trade Show Event – A Sold Out Show

by Shaun Fielder, Executive Director

An extremely productive event at the Lake Morey Resort in Fairlee this May. Golf participants on Wednesday afternoon enjoyed a sunny warm day. Congrats to the winning team of Fletcher, Fletcher, Fielder, and Harries. Longest drive goes to Riley Fletcher. Closest to pin winner was Bill Kane, within 8' 7". We had an excellent dinner on Wednesday night with VRWA team, board, and many special guests taking part.

Thursday was extremely busy with great training and very active vendor display area. Thanks for all those firms who joined us to showcase their firm's products and services. In the Vermont Drinking Water Week Taste Contest the Hinesburg Water Department took top honors for best tasting water in Vermont. To all who conducted training sessions a big thank you. This includes, Scott Kelley (Suez Advanced Solutions), Margaret Dwyer (Winhall Stratton FD), Ed Savage (West Rutland), Harry Hinrichsen (Town of Barre), Rod Lamothe & Eileen Toomey (Endyne Inc.), Eamon Twohig (VT DEC WasteManagement & Prevention Division), Ben Montross (VT Drinking Water and Groundwater Protection Division),

(Continued on page 9)

Planning For The Future

Succession Planning in Action – Vermont

by Matt Guerino, Training Specialist

If you have been to one of my classes over the past few years, you have heard me talk about the aging of our Water Operation work force. The average age of water operators nationally is over 50 years of age. As I teach new operators a few times a year, I can tell you there is a growing group of older operators leaving the profession, with new operators coming into the business with varying ages. As a professional group, we have a challenge to fill the gap that is being created by the operators leaving this vocation.

The challenge isn't just who do we hire but what kind of employee(s) do we need. There are a few water systems in Vermont that have hired not based on if the person has a valid operator certification but based on what kind of person they need. You may have heard this called succession planning. For water systems with more than one operator you may consider hiring people with specific knowledge in a specific area. A good example of this is Hartford Water System.

From left to Right:: Zach Lenning, Jeremy Delisle, Evan Eccher, Rick Kenney, and Kurt Dermody

Hartford Water System has many water operators and have been hiring not based on certification but on experience. Their operators (see photo) have experience in construction, masonry, technical system management, automobile mechanics and corrections officer background. The previous experience of each operator has helped their water system operate at a high level. They make sure that each operator has experience doing all aspects of water system operation. Together they have over 77 years of experience but work well as a group to effectively operate and manage their water system. They help develop their water operators become certified but they also develop the operators for the future giving them time to take management courses, operational courses, finding time for operators to join boards and take part in

(Continued on page 9)

Who We Are

Since 1982, Vermont Rural Water Association has supported water and wastewater systems across the state. We provide many services, including training, source water protection planning, and onsite assistance.

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Vermont Rural Water Association

Letters

Shaun,
I am writing to tell you about what a great service Rural Water/ Wastewater has been over the years for the Village of Johnson. Between the trainings, leak detection and sometimes just another set of hands, Rural Water has been a most valuable resource for our system operators. Just recently I asked Wayne Graham if he would assist us in rebuilding our #2 sludge pump for I have never done it before. He was eager to jump right in and called it fun even though the smell of the sludge was quite offensive. His insight was invaluable as we worked through the long day we were able rebuild it successfully. He gave awesome training to us so we can rebuild our other two sludge pumps.

Thanks again for all you guys do.

Tom Elwood
Chief Operator
Village of Johnson

News on Tap

Vermont Clean Water Week

VRWA has joined as a sponsor for Vermont Clean Water Week July 29 - Aug 4, 2018. Vermont Agency of Natural Resources is coordinating at this time and more info including how to sponsor and be involved at this link:

http://dec.vermont.gov/watershed/cwi/clean-water-week

VRWA Welcomes New Board Member

Board of director election results were announced during the VRWA annual business meeting on May 10 by President Ed Savage. Margaret Dwyer (Winhall – Stratton Fire District) and Rod Lamothe (Castleton Meadows & Endyne Labs) were re-elected to the board for three year terms. In addition Jon Thorthon (Bradford Water & Sewer Commission) joins the board for a three year term. Immediately following the conference event the VRWA board assigned Eric Blatt (Vermont DEC Facilities Engineering Division) to another one year assignment as a VRWA board liaison position. VRWA wishes to extend our sincere gratitude to Harry Hinrichsen (Town of Barre) as he completed 12-years of volunteer service as a VRWA director during the conference event. It was an honor having Harry serve on the board.

L to r. Eric Blatt (VT DEC Facilities Engineering Division - Board Liaison), Jon Thornton (Bradford Water & Sewer Commission), Rod Lamothe (Castleton Meadows), Richard Desautels (Colchester Fire District #2), Ed Savage (Town of West Rutland), Margaret Dwyer (Winhall - Stratton Fire District).

ORP Management in Wastewater as an Indicator of Process Efficiency

The following article submitted by Elizabeth Walker is reprinted with the permission of the New England Interstate Water Pollution Control Commission (NEIWPCC). It was written by Michael H. Gerardi, and appeared in the Winter 2007 issue of NEIWPCC's newsletter, Interstate Water Report.

Oxidation-reduction potential or ORP has been used for many years in facilities that process wastewater generated by metal finishing plants, but only recently has it become prominent in municipal wastewater treatment plants. When using a typical ORP device, an operator inserts a probe directly into a plant's tank or waste stream (usually two feet below the surface level). The probe contains a sensor that measures electrical charges from particles called ions, and these charges are converted to millivolts (mV) that can be either negatively or positively charged. Unlike "wet Chemistry" analysis that can be time-consuming and complex, ORP readings are instantaneous and easy to perform. And like all sampling measurements taken by operators, they are snapshots in time that can indicate process efficiency and identify treatment problems before they affect effluent quality.

When used in a wastewater treatment systems, oxidation-reduction potential is a measurement of the ability or potential of wastewater to permit the occurrence of specific biological (oxidation-reduction) reactions. Important oxidation-reduction reactions in wastewater treatment systems include nitrification, denitrification, biological phosphorus removal, biological malodor production, and the removal of cBOD (carbon- and hydrogen- containing compounds). These reactions involve carbon (C), phosphorus (P), sulfur (S), and nitrogen (N) and their change from oxidized states (containing oxygen) such as nitrate (NO3-) and sulfate (SO42-) and reduced states (containing hydrogen) such as ammonia (NH3) and sulfides (H2S).

Oxidation-reduction potential is measured in millivolts (mV). On the ORP scale, the presence of an oxidizing agent such as oxygen increases the ORP value, while the presence of a reducing agent such as substrate or cBOD decreases the ORP value.

By monitoring the ORP of wastewater, an operator can determine what biological reaction is occurring and if operational conditions should be changed to promote or prevent that reaction. For example, an operator doesn't want denitrification or "clumping" to occur in a secondary clarifier; the operator, therefore, must maintain an ORP value of more than +50 mV to prevent clumping. Similarly, an operator doesn't want malodor production to occur in the sewer system. So, the operator must maintain an ORP value of more than -50 mV to prevent sulfide formation and an ORP value of more than -100 mV to prevent volatile acid formation.

Let's take a look at each of these reactions and their relation to ORP values in greater detail.

Nitrification

To satisfy discharge limits for total nitrogen or ammonia, wastewater treatment plants must nitrify. Nitrification is the oxidation of ionized ammonia (NH4+) to nitrate (NO3-) and is performed by nitrifying bacteria when the ORP of the wastewater is +100 to +350 mV.

Denitrification

Denitrification is performed to satisfy total nitrogen discharge limits or destroy undesired filamentous organism growth. Denitrification is the reduction of nitrate (NO3-) to molecular nitrogen (N2) and is performed by denitrifying bacteria with ORP of the wastewater is +50 to -50 mV.

Biological Phosphorus Removal

Wastewater plants conduct biological phosphorus removal to meet total phosphorus discharge limits. The process consists of two treatment steps - first, biological phosphorus release and, second, biological phosphorus removal. In biological phosphorus release, fermentative bacteria produce fatty acids in an anaerobic tank having an ORP range of -100 to -225 mV. When the acids are absorbed by phosphorus-accumulating bacteria, the bacteria release phosphorus to the bulk solution.

In the second step - biological phosphorus removal - the phosphorus- accumulating bacteria degrade the absorbed acids in an aerobic tank and store the energy that was obtained from the degraded acids in phosphorus granules. This storage of energy requires the removal of large quantities of phosphorus from the bulk solution. The storage of phosphorus granules or biological phosphorus removal occurs when the ORP of the aerobic tank is +25 to +250 mV.

Sulfide Formation and Fermentation (Biological Malodor Production)

Biological malodor production occurs through two major biochemical reactions, sulfide (-SH) formation and acid formation (fermentation).

Hydrogen sulfide is produced in large quantity when sulfate-reducing bacteria degrade substrate using sulfate (SO42-). Sulfate is found in groundwater and urine and when reduced through bacterial activity, hydrogen sulfide (H2S) is formed. Sulfide formation, which occurs when the ORP is between -50 to -250 mV, is a critical event in an anaerobic digester, where the sulfide serves as a sulfur nutrient for facultative anaerobic and anaerobic bacteria including the methane-producing bacteria.

During the equally critical event of fermentation, acid-forming or fermentative bacteria produce a large variety of volatile acids, nitrogen-containing compounds, and sulfur-containing compounds. Many of these volatile compounds are malodorous. Acid formation or fermentation occurs when the ORP is between -100 and -225 mV. Fermentation is particularly crucial in biological phosphorus removal systems where the production of fatty acids is required for phosphorus release. Fermentation is also important in anaerobic digesters where many of the acids and alcohols produced through fermentation are used by methane-forming bacteria to produce methane.

However, these reactions must be appropriately confined. Septic conditions that permit sulfide formation and the discharge of sulfide into an activated sludge process should be corrected. The presence of sulfide promotes the growth of undesirable sulfide-loving filamentous organisms such as Beggiatoa spp., Thiothrix spp., and type 021N.

cBOD Degradation with Free Molecular Oxygen

Removal or degradation of cBOD with free molecular oxygen (O2) occurs when the ORP in the reaction tank or aeration tank is between +50 to +250 mV. The degradation is performed by cBOD-removing bacteria. The bacteria are aerobes (using only free molecular oxygen) or facultative anaerobes (using free molecular oxygen or another molecule such as nitrate).

Methane Production

Methane (CH4) production is highly desired in an anaerobic digester and undesired in a sewer system. Methane production is performed by methane-forming bacteria and occurs over a large range of ORP values, from -175 to -400 mV. Knowing the ORP values associated with specific reactions has allowed operators to use ORP probes, and the information gleaned from them, in a variety of helpful ways.

Within a sewer system, for example, an ORP value less than -100 mV indicates the production of malodors due to sulfide formation and fatty acid production. By adding sodium nitrate (Na2NO3) to a manhole, it's possible to increase the ORP value above -50 mV and prevent biological malodor production.

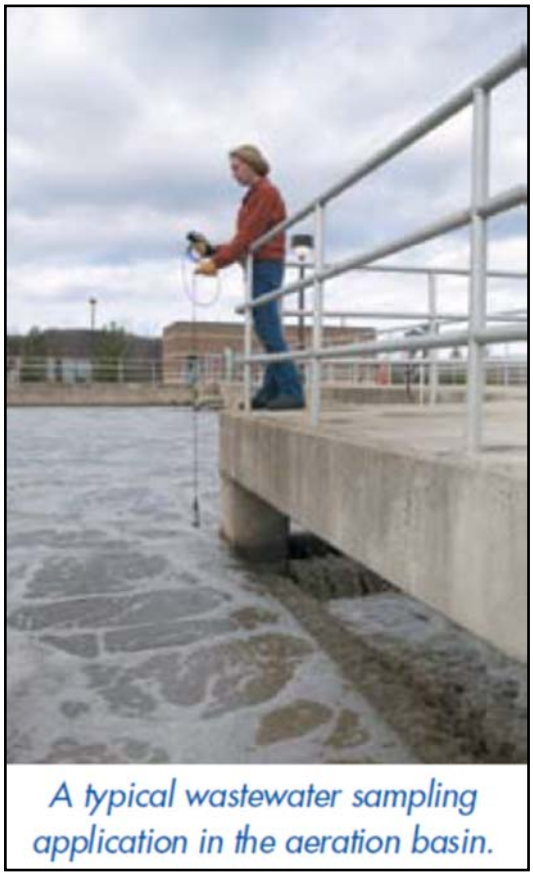
In another example, the transfer of thickener sludge that is heavily laden with nitrate to an anaerobic digester may be regulated by monitoring the ORP of the digester sludge. As the ORP increases from -400 mV, the transfer of thickener sludge may be terminated at a value less than -300 mV to prevent the loss of significant methane production.

Biochemical Reactions and Corresponding ORP Values

Biochemical Reaction	ORP, mV
Nitrification	+100 to +350
cBOD degradation with free molecular oxygen	+50 to +250
Biological phosphorus removal	+25 to +250
Denitrification	+50 to -50
Sulfide (H_2S) formation	-50 to -250
Biological phosphorus release	-100 to -250
Acid formation (fermentation)	-100 to -225
Methane production	-175 to -400

Consider too that the absence of denitrification within a denitrification tank may be detected with the use ORP and hydraulic retention time of the tank or cBOD feed (methanol or acetate) to the tank may be adjusted to promote denitrification. Likewise, the occurrence of biological phosphorus release may be monitored in a fermentative tank and if needed, hydraulic retention time may be increased in order to remove residual free molecular oxygen and nitrate that contribute to ORP values of more than -100 mV.

ORP probes are extremely versatile measurement systems for monitoring biological reactions within sewer systems and wastewater treatment plants, and for indicating to operators if acceptable or unacceptable biological activity is occurring. Increasingly, they are a tool that wastewater treatment plants must have and that operators must know how to use.



A typical wastewater sampling application in the aeration basin.

Developing Diversity in Municipal Water Systems

By Aaron Perez, Water Systems Specialist

Among the many challenges facing municipal water and wastewater systems is increasing diversification. The world is made of people with differing values diversity of values is important for creativity and productivity.

Groups with diverse race, ethnicity, gender, and socio-economic backgrounds have been proven to be more innovative at solving non-routine, complex problems than standardized groups. The apparent reason that diversity improves group decision making is that people from different backgrounds bring different knowledge and experiences to the table. The less apparent, but equally important, reason that diversity matters is that interacting with people who are different than you forces individual group members to think more about alternate viewpoints, to prepare better, and to put effort into creating. Diversity enhances creativity, leads to better decision making and problem solving, and improves the bottom line.

So, you may wonder what can be done?

First, I encourage you to review your hiring process. You should have policies and practices in place to ensure that you are hiring based on merit with special care taken to ensure procedures are free from biases related to age, race, gender, religion, and other personal characteristics that are unrelated to their job performance.

Even with improved procedures, you may find that you're failing to find and attract diverse candidates in the first place. If this is true for you, you may find that adapting the language you use in your job description and other organizational writing may be helpful to attract diverse candidates. For example, you might add "we're committed to building a culturally diverse team and we strongly encourage applications from female and minority candidates" to your job description.

Another consideration which has proven effective in hiring for diversity is to develop a diverse hiring committee. Despite the need to diversify our teams, I frequently see self-hiring teams—that is, teams that are solely responsible for their own hiring process including the hiring and training of their successors. Because people are likely to choose others who are like themselves this self-hiring model systematically decreases the odds of developing healthy and diverse teams. Hiring collaboratively improves the odds of developing diversity in our field.

We need to think outside the box and bring more diverse people into the water and waste water industry so we can continue and grow and innovate with the times.

Making The Grade

by Paul Sestito, Water Systems Specialist

I recently assisted VRWA Wastewater Circuit Rider Wayne Graham in conducting a Sustainable Utility Workshop for heads of the water and wastewater utilities in St. Johnsbury. It is a workshop that I have conducted or attended many times and I am always impressed with the discussions that occur when addressing sustainable utility management.

In preparation for assisting with the workshop, I researched a tool that I used when I taught the class- the American Society of Civil Engineers (ASCE) Infrastructure Report Card. The report card concept was first introduced in 1988 and ASCE published their first Report Card in 1998. The next Report Card was issued by ASCE in 2001 and has been distributed every four years, with the latest coming out in 2017.

In comparing the 2013 Report Card with the most recent 2017 Report Card, very little change was observed. The 2013 Report Card gave America's overall infrastructure a grade of D+, which was also the grade received when the Report Card was issued in 2017. In the Drinking Water category, the grade received was a D in both 2013 and 2017. In the Wastewater category, a slight improvement was seen from a D in 2013 to a D+ in 2017.

So, what does a grade of D mean? According to the grading scale, which can also be found on the website, a grade of D is described as "Poor, at Risk". Of the sixteen categories graded on the Report Card only four, bridges, ports, rail, and solid waste, received grades higher than D+.

Finally, the Report Card also includes the cost to improve the nation's infrastructure. According to the 2017 report, an investment of $4.59 trillion would be needed over the next ten years to improve America's infrastructure.

While the grades are not good, the outlook seems bleak, and the cost to improve feels overwhelming, there are things that can be done on the local level to address the issues facing our water and wastewater systems. As I mentioned in the first paragraph, I am always impressed with the discussions that occur when addressing sustainable utility management. Continuing to have these discussions, strive toward effective asset management programs, and stress the importance of properly functioning water and wastewater systems in our communities is something that we all do every day, and this does have an impact locally.

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"It was an honor to have Phyllis Simon as our special guest and to have many SOS employees present for the award presentation."

"VRWA 2018 Conference and Trade Show Event" continued from cover

David DiDomenico & Nick Giannetti (VT DEC Watershed Management Division).

At the business meeting VRWA President Ed Savage reported the 2017 audit was complete and resulted in an unqualified opinion for the association. VRWA honored many long time members and we were pleased to have VT DEC Commissioner Emily Boedecker join us to offer our keynote address. We presented our annual Tony Torchia Award posthumously to Mark Simon (Simon Operation Services). It was an honor to have Phyllis Simon as our special guest and to have many SOS employees present for the award presentation.

VRWA raffle ticket award winners were, 1st prize Brian Fleury, 2nd prize Amy Brown and 3rd prize to Earl Dyke.

Thanks to all our sponsors including, Platinum level – E.J. Prescott & Weston and Sampson. Gold sponsors – DN Tanks, Ferguson Waterworks, F.W. Webb, Otter Creek Engineering, Ti-Sales. Silver Sponsors - Ford Meter Box, Pump Systems, Statewide Aquastore, Surpass Chemical

All at VRWA look forward to the 2019 event back at the Lake Morey Resort and please save the dates, May 8 & 9, 2019.

"Planning For The Future" continued from cover

community events.

There is no specific answer to succession planning. I don't know of a 'one-size fits all' solution but I think we can learn from each other. I would start with an internal review of your water system. Look at what has worked in your system and what has not worked over time. Lastly, remember development of the workforce doesn't stop with finding the right person for the position but developing them for the future.

Water Operator Classification and other information can be found on the VT Drinking Water and Groundwater Protection (DWGWP) Divisions website: http://dec.vermont.gov/water/drinking-water/pwso .

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