Peterborough Upgrades its Wastewater Treatment Facility with Flexibility & Expandability in Mind

Lewis Gregory, Wastewater Operator Grade 4
Leads Operator, Peterborough Wastewater Treatment Facility

Like its fellow communities throughout New Hampshire, Peterborough is focused on positioning the Town for the future. So when it became clear that the 0.36-MGD treatment facility would no longer be able to meet tightening regulations for discharge to the Contoocook River, Town officials knew that the solution to the treatment plant problem needed to accommodate the possibility for future growth in the Town.

In 2002, the Town began what would turn into a 10-year program to upgrade its wastewater systems. The first step was an evaluation of the full system: wastewater collection, transport, treatment and disposal. This evaluation was led by Woodard & Curran overseeing a stakeholder group made up of Town staff, interested residents and a representative from the New Hampshire Department of Environmental Services. Residents included individuals from local businesses, Town boards and environmental groups.

Together the group worked to understand the issues, identify potential solutions – along with their shortcomings and advantages – and reach a consensus. All parties agreed that a flexible, expandable system would best suit the Town’s needs.

With all of this in mind, Woodard & Curran recommended that the Town build a Sequencing Batch Reactor (SBR) facility incorporating biological nutrient removal technologies. Construction began in July 2010 and in March 2012 the new 0.62-MGD facility went online.

The facility’s “green field” design incorporates fine screening, aerated grit removal, sludge thickening, odor control, and disinfection.
Stephanie Rochefort, Todd Gianotti, Mary Jane Meier, Steve Clifton, Gene Weeks, Dave Michelsen, Kurt Robichaud & Ben Mosher PE BCEE, Sharon Rivard PE, James Tilley, Laura Weit-Marcum, Steve Clifton, Mary Jane Meier, Stephanie Rochefort & Patricia Passariello PE

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**UPCOMING EVENTS**

- **Sept. 20, 2013** NHWPCA Fall Meeting - Peterborough NH WWTF.
- **Oct. 5-9, 2013** 86th Annual WEFTEC in Chicago, Illinois.
- **December 2013** NHWPCA Winter Meeting - Nashua NH.

**WORDS FROM THE EDITOR**

I’d just like to say that I really love being the editor of this newsletter! It’s an awesome group of people that I get to work with and I get to read all the interesting articles first. And fix the punctuation. Yup, I’m a little anal about apostrophes. I even take the time when texting and posting on Facebook to use proper punctuation. At first my kiddos would make fun of me, calling me the Punctuation Police, but now I find that they’re doing the same thing with their texting and posting. I won’t point it out to them, I know better. Recently, my son said to me “Mom, even though I don’t have a retirement plan, I’m still an adult, you know”. LMAO at that one! You just gotta love what comes out of the mouth of an 18–year old. Time for my usual plug now – please get in touch and join us because we are the most awesome committee!

For more information about the NHWPCA visit our website at www.nhwpca.org.
Peterborough’s SBR System

The Peterborough Wastewater Treatment Facility utilizes Aqua-Aerobics SBRs as part of its secondary treatment system. This system is a true batch reactor, which enables the settling process to occur under quiescent conditions. In the SBR process, aeration and settling occur in the same basin.

SBR systems have five steps that are carried out in the following sequence: 1) fill, 2) react (aeration), 3) settle (sedimentation/clarification), 4) draw (decant) and 5) idle. These steps are not mutually exclusive; therefore, six or seven treatment steps can be utilized. All treatment phases fall into either the “Fill Phase” or “Non-Fill Phase” of operation. At Peterborough, phases include: 1) mixed fill and 2) react fill. Non-fill phases include 3) react, 4) settle, 5) decant, 6) idle and 7) sludge waste.

Each reactor performs 4.5 cycles per day, with each cycle lasting approximately 320 minutes (5.33 hours). Maximum design flow is 1.43 MGD with a peak hydraulic flow of 2.48 MGD.

The new plant has proven to be flexible, efficient, and operator friendly. Plus it is serving as a regional septage facility, receiving and processing septage for five neighboring communities, thereby providing a source of income for the Town.

The upgraded $10-million facility was funded by a loan and grant from Rural Development American Recovery and Reinvestment Act (stimulus) money. In full compliance since start-up in March 2012, the facility is contract operated by Woodard & Curran and staffed 8 hours a day, 5 days a week. The facility’s SCADA systems allow remote management of many system irregularities should they arise during hours when the facility is not staffed.

(continue on next page)
It’s All About Carbon

By Wes Ripple, NHDES

When it comes to meeting typical secondary treatment standards, BOD, or carbon, is usually thought of as just another pollutant that must be removed in order to satisfy your permit. A lot of money is invested in removing carbon through high aeration and energy costs. When it comes to nutrient removal, however, carbon is now valued as a food source and becomes your best friend. It is hard to do the job without carbon. And very often you can end up paying to purchase and transport a chemical to the plant to use as a supplemental carbon source.

For nitrogen removal systems, carbon drives the denitrification reactions occurring in anoxic tanks. It serves as food for denitrifying heterotrophic bacteria, forcing them to use NO$_3$ for respiration as long as oxygen is not present, thus reducing nitrate to nitrogen gas and completing the nitrogen removal process. Carbon speeds reaction rates and allows more nitrate to be removed. For those plants needing to meet the 3 mg/l limit of technology for total nitrogen, supplemental carbon addition is almost always necessary. For those needing to stay within the range of 5-8 mg/l TN, supplemental carbon would help but may not be an absolute necessity.

Anoxic zones can be situated prior to the aeration basin (pre-anoxic) or after aeration (post-anoxic). In pre-anoxic systems, the influent BOD usually serves as the only carbon source. In post-anoxic systems, the influent BOD has already been removed in the aeration basin, making supplemental carbon addition a requirement. For both systems, it is generally accepted that a ratio of at least 4 mg/l soluble BOD is required to remove one part of nitrate. Many factors can affect this ratio and result in a higher than theoretical BOD requirement. The larger the BOD molecule, the longer it takes to break down, rendering the BOD less effective. Excessive amounts of D.O. in the tank will also allow some of the BOD to be oxidized aerobically, leaving less to be reduced under the more important anoxic conditions.

If your influent is weak or overly fresh and oxygenated, supplemental carbon addition may improve pre-anoxic zone performance and serve to reduce the nitrate loading to the post-anoxic zone. One way of internally increasing BOD to pre-anoxic zones in plants having primary clarifiers is to bypass all or a portion of the influent flow around the primaries. If this is not an option, try operating with a higher primary sludge blanket to encourage the formation of volatile fatty acids. Volatile fatty acids are formed during the early stages of septicity. Acetic acid is a short chained volatile fatty acid that is rapidly metabolized by bacteria and leads to enhanced denitrification rates. Gravity thickeners have been successfully converted to pre-fermentation tanks specifically for this purpose. This also works especially well for biological phosphorus removal systems.

Carbon purchased in chemical form will work in both pre- and post-anoxic zones. The only requirement for post-anoxic zone supplementation is that the chemical additives contain relatively low levels of nitrogen and phosphorus as these two nutrients will end up in the effluent. The higher the BOD or COD the better as this translates to less chemical used. Careful dosage of chemical is required as an excess will bleed BOD out with the effluent. Sludge yield is also a consideration. Since you are essentially feeding the bacteria with a concentrated food source, the bacteria will grow and reproduce, producing more sludge to waste. Different carbon sources have different sludge yields.

Methanol has been used extensively as an external carbon source in post-anoxic zones for years. Its COD of 1,888,000 mg/l makes it an attractive chemical to use. Methanol does have its drawbacks, however. It is easily ignited and highly toxic, both in liquid and vapor form. Some people say it is less dangerous than gasoline. In 2006 two people died and one was seriously
burned in a methanol explosion at the City of Daytona Beach Bethune Point WWTF. Denitrification using methanol requires the growth of specialized bacteria called methylotrophs which can result in an acclimatization period of several weeks before denitrification becomes established. Their lower growth rates and slower activity at colder temperatures generally requires larger sized anoxic zones. Many engineers automatically design carbon supplementation systems around methanol, even if that is not what will ultimately be used. Methanol does increase capital construction costs by 25-31% over that of a non-hazardous supplemental carbon system.

There are safer and more effective alternatives to methanol and a lot of research is currently being done in this area. Studies have been conducted using generic chemical compounds; concentrated acetic acid, high fructose corn syrup, glycerin, molasses; food processing wastes obtained from dairies, breweries, wineries, soft drink and fruit juice bottling; as well as H$_2$S, methane, sawdust, wood chips, cotton, newspaper, just to name a few.

A little investigation may reveal some good options right nearby or in your own town. Pilgrim Foods, located in Greenville, NH, is a producer of mustards, vinegar and fruit juices. On average, they generate a wastewater flow of around 5,000 GPD with burned in a methanol explosion at the City of Daytona Beach Bethune Point WWTF. Denitrification using methanol requires biodiesel, which should generate around 50,000 gallons per year of crude glycerin.

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For questions and/or comments, email me at Wesley.ripple@des.nh.gov
NHWPCA Committee Spotlight

Your Education Committee

By Mary Jane Meier, NHDES

The purpose of our Education Committee (Ed Comm) is to research training opportunities for NHWPCA members. It works in conjunction with the NHDES Wastewater Operations Section to offer varying course selections each spring and fall. Each training session features 12 to 15 classes. Registration for the classes is open to all persons interested in wastewater treatment education, for members and non-members, alike. The NHDES Wastewater Operations Section administers the training program and classes are held primarily at the NHDES Franklin training center. The classes assist operators and future operators with the necessary training hours to meet the licensing requirements in the State of New Hampshire. Program advertisement can be found on the NHDES website at des.nh.gov/organization/divisions/water/wweb/categories/training.htm.

The value of the training program depends on the input received from the Ed Comm members. Over the years, the Ed Comm generally has 10 to 14 members. The wide range of professional backgrounds from each individual member improves the relevance, variety and quality of the training topics offered. The combination of training topics is assembled from suggestions made by members who share contact names of those engineers, trainers and manufacturer representatives who know the science behind their products well. The success of our educational programs is dependent upon generous voluntary contributions of instructional time and educational resources by dedicated individuals who are willing to share knowledge and experience with fellow members of the public works profession. A special thanks to all presenters past and future, for their willingness to donate their time to assemble the course materials, travel to Franklin and make the presentation. Our program benefits from their knowledge, teaching style, enthusiasm and genuine interest in presenting the materials while matching the interests of wastewater operators and public works staff from throughout the state.

The Ed Comm develops the topics offered each session from a variety of sources. We circulate interest surveys to the general membership and the WWTFs statewide. We evaluate the results and use the popularity of topics to steer our search for trainers. We welcome suggestions year round. Any ideas can be relayed to members via the contact information available on the website at nhwpca.org/education/. The Safety Committee also contributes training topics that are incorporated into the programs. Suggested training topics are often featured as the technical sessions at our Association’s Annual Trade Fair in April.

And now to share the best news as a reward to those who read this entire article! Training/Operator Outreach funding from an EPA Grant has been applied in the form of a Training Services Contract to fund the training costs for the Fall 2012, Spring 2013 and Fall 2013 wastewater operator training sessions. NHDES awarded the contract to the North East Water & Wastewater Training Associates, NEWWTA, owned and managed by Greg Kidd. The result is that registration costs are waived for NH Wastewater and Collection System Operators for all classes offered through NEWWTA for the DES training program.

Please note that if a person registers for a class and fails to cancel their registration within 48 hours of the class, there will be a $40 cancellation fee assessed to the individual or the municipality where they work. More information is contained in the Fall Training Program flyer distributed in August. Questions can be directed to Mary Jane Meier at 603-271-5553, or maryjane.meier@des.nh.gov.

Happy Labor Day

We look forward to serving the membership. We embrace the truth that continued education is an investment in your future. And the future of the environment is dependent on that investment. As wastewater treatment technology advances, staying in touch with the complexity of the science is a daunting task. We achieve success together through sharing information and knowledge to properly operate and maintain our facilities. See you at class!
Are You Abusing Your Most Important Tools?

Submitted by Patricia Passariello, PE – NHWPCA Safety Committee

Do your hands have scars, cuts, bruises, calluses, rashes, damaged or missing nails, deformities or even a missing finger or two? You’re not alone. According to the U. S. Center for Disease Control and Prevention, hand injuries account for well over a million emergency room visits by workers every year in the United States. Even worse, one statistic found that 70% of injured workers were not wearing gloves and the other 30% of injured workers were wearing gloves, but the gloves were inadequate, damaged or the wrong type. So, if you follow the math through, that means that 0% of injured workers were wearing appropriate PPE; conversely, 100% of those workers wearing appropriate PPE did not need to go to the emergency room. Although this statistic may be slightly exaggerated, it does offer evidence that proper selection and use of PPE will definitely minimize the chances of injuring your hands.

The Occupational Safety & Health Administration’s (OSHA’s) standard for hand protection requires that employers determine appropriate Personal Protective Equipment (PPE) and require employees to use this PPE to guard against the following:

- Absorption of harmful substances through the skin
- Severe cuts or lacerations
- Severe abrasions or punctures
- Chemical or thermal burns
- Temperature extremes

Although you and your employer may not be governed under OSHA, your hands are one of your most important tools at work and in life. Hands are also one of the most vulnerable parts of your body, since they are always doing the work, and because they are generally the closest body part to the work. Hand injuries are also difficult to heal and very prone to infection due to the fact that they are usually dirty.

Protect your hands by:

- Properly storing and handling sharp tools and mechanical equipment
- Avoiding exposure/burns from chemicals and hot surfaces
- Using proper PPE such as gloves, tapes, guards and barrier creams
- Staying alert to potential hazards
- Practicing good personal hygiene

It’s time to start taking better care of your most important tools!

THINK SAFETY TODAY.....BE ALIVE TOMORROW
Just bought my plane ticket last night, so most of my thoughts right now are on vacation! There’s a lot of preparation to be made in a WWTF lab before the primary analyst goes away on vacation. Especially a long vacation like I’m going on. Not to gloat, but I have TWELVE days coming up when I won’t be setting foot in a WWTF once! Even though I’m pretty darn sure that there will be a cool treatment plant to see in South Carolina. After all, who could resist a random visitor from a WWTF many states away looking for a quick tour?

Moving along now, there is a lot to be done before a planned vacation by the primary analyst. Most importantly, one must have a good structure in place making vacations, unplanned absences or sicknesses and even natural disasters easy to handle.

A sampling plan should list what samples MUST be collected at what frequency for all permit parameters. Required sample type (grab or composite), holding times and preservation should also be included. All of this information should be posted in the lab. That way, anybody can walk into the lab and quickly and easily see what is supposed to be happening that day. The sampling plan should be written so that anybody can look at and understand it. We all know what “INF” and “EFF” mean, but if there was a natural disaster and City staff from another department had to look, they probably wouldn’t know. You think? It is important to spell out complete names and even have a location map of where to collect these samples.

Next, look at these required samples and evaluate who is qualified to run them. A large WWTF with a big staff probably has several people qualified, but it’s a little bit trickier in a smaller plant. I go through my sampling plan parameter by parameter to evaluate. Everybody here is qualified to run pH and TRC so I don’t need to fret over those. E-coli also has a team ready to step in. My other grab sample parameter, ammonia, only has me as the qualified analyst. Luckily, this sample can be preserved and held. There is another step to think about when a sample can be preserved and held. Proper sample containers and preservation chemicals must be available and easy to find.

I collect composite samples for BOD, TSS and total phosphorus. BOD is the most problematic sample because of the 48-hour holding time and the fact that I’m the only qualified analyst. In case you’re wondering why I’m the only qualified analyst that myself! The truth is that I work at a plant with a highly-qualified, talented staff and we work hard eight hours each day. There just isn’t the time to take somebody away from their primary responsibilities for enough hours to stay proficient in these other lab tests. I certainly don’t want to set anybody up for failure by leaving them to do a test that they haven’t had enough practice with. So, I have the phone number to a contract lab handily posted and extra sample bottles so that samples can be shipped out on a moment’s notice!

For a planned vacation, I will post a schedule of what needs to be done, contact the contract lab to schedule pick-ups and have all the sample bottles ready and chains of custody filled out except for spaces for sample time which will be highlighted. (No, I don’t call it being a Control Freak, I call it the Normal Laboratory Personality) If I’m out unexpectedly, all the tools are in place for somebody else to do this. I can take a deep yoga breath and relax and know that when I’m back at work that all the samples will have been properly analyzed either by qualified staff or a contract lab.
Friday, June 21st was a gorgeous day for the NHWPCA’s summer meeting at Ellacoya State Park. While I was walking around and enjoying the weather, I was asked “how do you like your new hypo pumps?” I also heard conversations about new permits, blowers, mixers, industrial discharges and BOD analysis. I even got involved with sketching out filaments on a napkin! I do want to say many thanks to those of you who took the time to compliment this newsletter. Yes, there was sunshine and delicious food. More importantly, the summer meeting is an amazing opportunity for networking and learning. - Stephanie

You can view more photos from the 2013 Summer Meeting on the Association’s website at www.nhwpca.org
From Nuisance to Resource
By Benjamin Mosher, P.E., BCEE, Principal, CDM Smith

In 1993, the USEPA promulgated the “Standards for the Use and Disposal of Sewage Sludge” as 40 CFR Part 503. These rules defined the management practices and numerical criteria related to land application, incineration and surface disposal of biosolids with the primary goal of protecting public health and the environment. Despite only limited modifications to the regulations over the past two decades, the industry view of biosolids has changed dramatically. Along with the general shift in focus from wastewater treatment to water reclamation, the prior nuisance associated with sludge disposal today is commonly viewed as a significant resource recovery opportunity. There is significant chemical energy embedded within biosolids and recovering that energy is an opportunity for wastewater utilities to reduce costs and increase sustainability.

Beneficial use of biosolids has been increasing, with nutrient recovery through land application almost doubling in the past 15 years (from 33% in 1989 to 55% in 2004). Energy recovery from biosolids has been growing even more quickly at facilities equipped with anaerobic digestion where 24% of plants currently convert biogas to electricity and 85% of WWTPs beneficially use their biogas for heat and/or electric production. In addition, advances in digestion technology continue to be made, most recently in the areas of thermal hydrolysis and electrical pulse treatment, which can significantly increase the volatile solids destruction and corresponding biogas production. These and other recent developments in the industry have provided some municipalities with significant biosolids management cost savings, notable environmental sustainability benefits, and have led some to reach energy neutral status with the water reclamation facility serving as a net exporter of energy.

Though there are only a few municipal water reclamation facilities (along with a few industrial pretreatment facilities) within the State of New Hampshire that utilize biosolids digestion and biogas energy recovery systems, the state is not isolated from the changes and challenges in this industry. There have been recent developments in the regional biosolids industry which impact the New Hampshire recovery/reuse market, including:

- In February 2011, the federal sewage sludge incinerator (SSI) regulations were modified to consider sludge that is combusted as solid waste and, therefore, it is now regulated under Section 129 of the Clean Air Act (CAA). While many of the New Hampshire water reclamation facilities are not intending to pursue new incineration projects, what this means is that incineration as an option for wastewater solids management is becoming more costly. More specifically, if any regional SSI shuts down in response to the new standards (as has happened with the incinerator at Fitchburg, MA), there will be an increase in supply of biosolids materials to be managed in the New England market.
- The Massachusetts Solid Waste Master Plan proposes a goal of reducing the quantity of waste disposed in the Commonwealth by 30% by 2020. To this end, the MassDEP has announced its intention to ban certain large scale (e.g. commercial and institutional) Source Separated Organics (SSO) from landfills beginning in the summer of 2014. The diversion is likely to involve the co-digestion of SSO food waste along with municipal biosolids. Though a similar ban is not currently pending in New Hampshire, the Massachusetts ban is spurring significant evaluations, development and funding for new and expanded biosolids/SSO processing facilities. This development will not only have an impact on the New England biosolids management market, but will also result in a large influx of fertilizer and soil amendment products entering the marketplace, which will compete with current biosolids land application practices in New Hampshire.

With the recent advances, regional changes and on this 20th anniversary of the Part 503 regulations, the Grappone Conference Center in Concord will serve as the venue for the Northeast Biosolids and Residuals Conference on October 29th and 30th. Key topics to be covered will include:

(continue on next page)
• History & perspective regarding the effects of Part 503 in the Northeast;
• Wastewater plants as resource recovery facilities;
• Sustainability and energy use;
• Residual products (Land application, Enhanced soil amendment, Fuel);
• The financial realities of residuals and biosolids management;
• Alternative feedstocks in residuals processing and energy production (e.g. co-digestion);
• and many more.

Come and learn about the exciting changes in the New England biosolids market.

Data Collection – Where is this Headed?
By Sharon L. Rivard, P.E., NH Department of Environmental Services

Have you had a visit from Sharon Rivard or Ana Ford at your wastewater treatment plant (WWTP) this summer? Or maybe, you have a visit scheduled? If you have not heard from one of us, you will…but don’t worry, it’s not too painful! Are you wondering why we are asking so many questions about your WWTP and collection system? By visiting each WWTP and collection system in a relatively short period of time, we have the unique opportunity to do some important outreach on climate change while we also collect valuable information from the WWTP operators who know their WWTPs inside and out. We learn something new at every WWTP we visit, so the outreach is going both ways. We are also able to pass one operator’s knowledge and ideas on to other operators as we work our way around the state.

The information we are collecting is the first step toward building a database for the N.H. Department of Environmental Services (DES) Wastewater Engineering Bureau that will be used to better serve operators, municipal officials, regional planning commissions, DES and the general public. This database will also help retain the valuable knowledge that has been accumulated by veteran DES or municipal staff before they retire. In addition, we can use this database to connect operators to each other for mutual aid type assistance and for treatment-specific training workshops and round table discussions.

For those operators we have already interviewed, you know that we spend quite a bit of time talking about energy audits, energy efficiency, asset management, emergency operation and flooding. These topics are all related to climate change in one way or another. As part of this climate change outreach effort, we prepared several fact sheets for reference. These fact sheets are provided during the interview but they are also available at: http://des.nh.gov/organization/commissioner/pip/factsheets/wwt/index.htm. Additional fact sheets will be written to answer some commonly asked questions once we complete the data collection portion of this project. The climate change related data we are collecting will be incorporated into a DES Climate Change Plan for Wastewater Utilities, which will also entail changes to our DES Standards of Design and Construction for Sewerage and Wastewater Treatment Facilities.

Terms such as energy audits, energy efficiency, asset management, flooding and climate change are becoming part of everyday language for those in the wastewater industry. If you have not heard these terms yet, you will soon. We are all impacted by climate change and we should make every effort to both mitigate (correct it or at least slow it down) and to adapt to it.

The DES Clean Water State Revolving Fund program is offering partial loan forgiveness for energy audits and asset management programs this year, so take advantage of this money and get your programs started. For more information on the loan forgiveness, see the article by James Tilley and Laura Weit-Marcum in this issue of The Collector.

For more information about the 2013 Climate Change Outreach and Data Collection project, please contact Sharon at 271-2508 or Sharon.rivard@des.nh.gov.
Clean Water State Revolving Fund: An Affordable Financing Opportunity

By James Tilley and Laura Weit-Marcum, NH Department of Environmental Services

The New Hampshire Department of Environmental Services (DES) administers the Clean Water State Revolving Fund (CWSRF) program to provide loans with below market interest rates to communities and other local government entities to improve and replace wastewater collection and treatment systems. CWSRF funds may also be used to finance nonpoint source, estuary management and watershed protection and restoration projects. The ultimate goal of the CWSRF is to help communities protect public health and improve water quality throughout New Hampshire.

Each spring DES solicits projects through a pre-application process to determine which communities may receive a CWSRF loan. DES ranks projects using a rating system to prioritize projects for the most cost effective use of available funds. The rating system assigns points based on the extent to which the project will protect public health, improve water quality, use sustainable technologies and incorporate climate change adaptation or mitigation strategies.

DES develops a project priority list based on project readiness to proceed and priority rating. This list is included in the preliminary Intended Use Plan (IUP) and a public hearing is held each August to solicit comments on the IUP. Following the public comment period, the IUP is finalized and applicants with projects above the “fundable line” of the project priority list are eligible to apply for a loan in the coming year. The total cost of all fundable projects must not exceed the amount of financing available for that year.

To obtain funding for a project on the IUP, applicants file a loan application after receiving authorization from their governing bodies to raise, appropriate and spend loan funds. The completed loan application includes the source of loan repayments, a project schedule, and information about the potential impacts of construction activities for an environmental review.

This year DES is providing financial incentives to encourage communities to become more cost-effective and energy efficient. DES will forgive a portion of a loan’s principal if the recipient agrees to create an asset management program or complete an energy audit that conforms to DES’s minimum standards. Loan recipients implementing an existing asset management program or energy audit recommendations are also eligible for principal forgiveness.

Asset management programs must include an inventory of assets, prioritization of assets, a plan and schedule for the program, implementation of the program, annual review of the program and a repair and replacement reserve account that is at least two percent of the total yearly wastewater operation and maintenance budget for a minimum of five years. Energy audits must include a review of energy use and rates, an energy balance, process system evaluation, cost-benefit analysis and be performed by a qualified consultant.

For more information about the CWSRF program, please visit our website at http://des.nh.gov/organization/divisions/water/wweb/grants.htm or contact James at 271-3249 or james.tilley@des.nh.gov or Laura at 271-3307 or laura.weit-marcum@des.nh.gov.

Don’t Forget to Set your Clocks Back November 3, 2013
Vertical Mixing
By Gene Weeks

What could be an easier job than mixing a liquid that is mostly water in a vented tank? There are many types of equipment offered to mix liquids and all of them work – somewhat. Well, if the job of mixing is so easy, why do some of us have so many issues with the parts of our process that call for mixing? Why do we have sludge buildups where we don’t want them? Why do some of us always seem to have a mixer pulled out for repair? Why are we battling grease layers and piles of rags in our pump stations? Why do we struggle to get a uniform mix of sludge in our sludge basins? One possible answer to these questions is that we are mixing in the wrong orientation. Think of mixing batter for a cake. We could move our mixing spoon in a horizontal circle spinning the batter like water going down a drain, or we could reach down to the bottom of the bowl and bring contents from the bottom of the bowl to the top. Our mixing spoon would still make something like a circle, but a vertical circle, bottom to top – top to bottom. This is much quicker and more effective than a horizontal circle. Try it!

The same principle is true in our plants. If our mixing equipment is spinning our liquid in a horizontal circle, what is lifting the sludge that tends to settle to the bottom? Nothing is, and some of us have the sludge buildups to prove it. What if the mixing action is so ineffective that only the liquid moves, but the solids settle to the bottom? There are several manufacturers now offering mixing equipment that creates vertically oriented vortices instead of horizontal ones. You and your engineering firm now have several choices of mixing equipment that will produce much better results than you may be getting from the equipment you have now. Imagine sludge basins with an even distribution of solids. Basins with fine bubble or coarse bubble aeration can have no sludge buildups on the floor or in the corners. Chemicals can be mixed gently and thoroughly without shear forces. Pump stations with vertical mixing can move the grease and rags each pump cycle rather than having them accumulate and cause problems. Vertical mixing can also save energy, after all the down part of the up and down motion is helped out by gravity.

Speaking of saving energy – what is the biggest energy user in your plant? For many of us the answer to that question is the blowers used with our fine bubble aeration system. Suppose you added a vertical mixing system to those aeration basins, and suppose that mixing system actually mixed the fine bubbles along with the water? What happens if those fine air bubbles stay in the water longer because the mixing action is dragging them back down? Doesn’t it make sense that the Dissolved Oxygen would go up? And maybe the DO would go up enough to allow you to turn down the blowers and save on that electric bill. Some manufacturers of vertical mixing systems are claiming exactly that result.

Is mixer maintenance causing you headaches? Is it your plant that always seems to have a mixer pulled out for maintenance? Some manufacturers of vertical mixing system do not have any motors or even any moving parts in the tank.

Maybe the next time you meet with your engineering firm you should ask if vertical mixing could solve problems for you and your plant.

Congratulations to the Recently Certified Wastewater Operators!

**Grade 4**
David St Armand

**Grade 3**
Matthew Cusato, Brandon Corey, Steven Swensen.

**Grade 2**
Jason Bellemore, Richard Boone, Aaron Cartie, Ray McNeil, Bill Washok,
Jason Young, Eugene Berthiaume, Kevin Brodeur, Jason Cairelli,
Brandon Dupuis, Ken Jennings, Leo Lavin IV.

**Grade 1**
Cody Boisvert, John Bridgmon, Charlie Damour, Dan Davis, Doug Fisher, Gary Hancock, Meredith Hoyt, Joseph Kinduris,
If you followed along with the last article, I offered to guess the weight of your mixed liquor. I have to lower the price because I found an error in the calculations after an astute reader called me on it.

So the bad news is I was off by a significant amount – 2.2 in fact. It happened to be the conversion of kilograms to pounds.

Now for the good news, guessing the weight of your mixed liquor, regardless of your aeration tank size seems to be in the ballpark! So instead of 2.42, multiply your numbers by 5.42.

Here is the information restated:

Here is the new equation, noting that I now use 5.42 as the factor:

Your weight is: ______ Flow x _____ BOD₅ x ____ SRT x 5.42 = _______ MLSS in pounds

For the example, we get the following weight of MLSS:

Example weight is: 1 MGD Flow x 120 mg/L BOD₅ x 8 day SRT x 5.42 = 5,206 pounds

Now if you want to know your MLSS concentration, take the pounds of MLSS estimated and divide it by your aeration tank volume in million gallons (MG) and 8.34. If our example WWTF has 400,000 gallons of aeration tank volume on line, then the MLSS concentration would be:

Concentration of MLSS - 5,209 pounds MLSS/ (0.4 MG x 8.34) = 1,560 mg/L

This estimate assumes a typical residential wastewater from a WWTF with primary clarifiers.

For raw sewage going right into aeration (no primary clarifiers), multiply your answer by 2.13! So this would be 2.13 x 5,209 pounds MLSS = 11,096 pounds of MLSS.

So here is the good news. I was given data from several plants from the most knowledgeable wastewater engineer that is well known and respected. After a rough start and finding the conversion error, we applied these factors to each of the treatment facilities. Here is the comparison of the actual MLSS versus my guess. It was a really good guess with primary treatment and not so good without primary treatment. Some facilities were right on.

(Continued on next page)
Give it a try and let me know by email if I guessed your weight correctly. If you are interested, email me and I will provide you with the spreadsheet to more accurately estimate your MLSS weight at wsclifton@underwoodengineers.com.

Veterans Day

Thank a Veteran for Their Service

Nov. 11, 2013
August 1st, 2013 was the date of the re-adoption of the Certification of WWTP Operator Rules, Env-Wq 304. This fact sheet from NHDES does a very good job of explaining the current rules.

WD-WEB-2 2013
Wastewater Treatment Certification

Wastewater treatment plant operators play a key role in protecting New Hampshire’s surface waters and groundwater. Operators maintain and operate various types of mechanical and computerized equipment in wastewater treatment facilities in order to remove the harmful components from wastewater and render the water suitable for discharge to a surface water or to groundwater. They operate and maintain pumps, pipes, valves and processing equipment to move wastewater through collection systems and through various treatment processes. They read and interpret meters and gauges. They also operate chemical-feeding devices, perform laboratory analyses and keep records of their work. They must be able to take on many different tasks and be familiar with electricity, mechanics, chemistry, microbiology, hydraulics and many other disciplines.

Due to the importance of ensuring that wastewater is properly contained, conveyed and treated prior to being discharged, New Hampshire law requires public wastewater treatment plants to be operated only by operators who have been certified by the Department of Environmental Services (NHDES). The certification process is designed to make sure that certified operators have the knowledge and ability to properly operate and maintain such plants and the associated collection systems.

Individuals who are interested in becoming a certified wastewater operator in New Hampshire who are not certified elsewhere must pass a written examination. Individuals who are certified elsewhere can apply to be certified by reciprocity (that is, without taking the examination) for Grades I, II, and III. The qualifications for each of the certification grades are as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Experience</th>
<th>Education</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-OIT</td>
<td>0</td>
<td>12 years</td>
<td>HS diploma or HSE for education; upgrade to Grade I after earning 1 year full-time related work experience</td>
</tr>
<tr>
<td>I</td>
<td>1 year</td>
<td>12 years</td>
<td>HS diploma or HSE for education</td>
</tr>
<tr>
<td>II-OIT</td>
<td>1 year</td>
<td>12 years</td>
<td>HS diploma or HSE for education</td>
</tr>
<tr>
<td>Or</td>
<td>0 years</td>
<td>13 years</td>
<td>HS or HSE plus 1 year wastewater certificate</td>
</tr>
<tr>
<td>II</td>
<td>3 years</td>
<td>12 years</td>
<td>HS diploma or HSE for education</td>
</tr>
<tr>
<td>III-OIT</td>
<td>2 years</td>
<td>14 years</td>
<td>HS or HSE plus 90 CEUs or 2 years college</td>
</tr>
<tr>
<td>III</td>
<td>4 years</td>
<td>14 years</td>
<td>HS or HSE plus 90 CEUs or 2 years college</td>
</tr>
<tr>
<td>IV-OIT</td>
<td>4 years</td>
<td>14 years</td>
<td>HS or HSE plus 90 CEUs or 2 years college</td>
</tr>
<tr>
<td>IV</td>
<td>6 years</td>
<td>14 years</td>
<td>HS or HSE plus 90 CEUs or 2 years college</td>
</tr>
</tbody>
</table>

1 HSE refers to a High School Equivalency Certificate such as a G.E.D.

(continue on next page)
Certification by Examination: Examinations are usually held in June and December of each year at the NHDES Operator Training Center in Franklin. Applicants must submit a complete, signed application with a $50 fee no later than two months prior to the date of the examination. (All application forms must be obtained from NHDES, either at the address above or from the NHDES website at http://des.nh.gov/organization/divisions/water/wweb/documents/certapp.pdf.) The Certification Committee established by statute reviews each application and required supporting documents, determines the applicant’s eligibility, and notifies the applicant in writing of whether he or she has qualified to take the examination. An applicant must achieve a score of 70 percent correct or higher to pass an examination for any Grade, including OIT grades. Any applicant who passes the OIT exam for the desired Grade must complete the full experience requirement prior to receiving a full Grade certificate.

Certification by Reciprocity: An operator certified in another jurisdiction may apply for reciprocity for Grades I through III by so indicating on the application form. The Certification Committee will review the application and the requirements for certification of the certifying jurisdiction. The Committee will issue a certification by reciprocity if it determines that (1) the requirements of the other jurisdiction are equivalent to New Hampshire’s, (2) the individual is actively seeking employment in New Hampshire, and (3) the certification was obtained by examination.

Meeting with Committee: Each applicant who meets all requirements for a Grade II or II-OIT or higher certification, whether by examination or reciprocity, must meet with the Certification Committee prior to receiving certification. Certain applicants who meet all requirements for a Grade I certification also must meet with the Committee prior to receiving certification.

Renewal: Once an individual is certified, he or she is responsible for renewing the certification every two years. The individual must submit a complete, signed renewal application with a fee of $50 to NHDES prior to expiration of his or her existing certificate. If the renewal application with full payment is not received prior to the certification’s expiration, the certification can still be renewed by submitting the application, renewal fee, and an additional late fee of $25. After 90 days, the certification is expired and recertification will require a completely new application and retaking of the examination.

Continuing Education: Certified operators are required to complete on-going education and training to renew their certifications. Each operator must submit proof that he or she has completed the required number of Continuing Education Units (CEUs) with the renewal application. For Grade I and I-OIT, 1.0 CEU is needed per renewal period. For Grades II and above (including OIT grades), 2.0 CEUs are required per renewal period. CEUs are calculated based on ten hours of education equaling 1.0 CEU, or one college credit equaling 1.5 CEUs. If a certified operator earns more than the required number of CEUs, the operator may carry the excess CEUs forward to the next renewal period. A Grade I or I-OIT may carry forward 0.5 CEU, while operators at Grade II and above may carry forward 1.0 CEU.

NHDES offers training courses in the spring and fall of each year at the NHDES Operator Training Center in Franklin. Classes are held during the day, and typically are five hours long with a one-hour lunch break. A wide variety of wastewater-related subjects are addressed during each session. Operators earn CEUs for each class attended. Course schedules and registration materials are available from NHDES approximately four weeks in advance of the first class. Registration is on a first come, first served basis. A nominal fee is charged to cover building and administrative expenses.

For more information: Contact the NHDES Water Division, Wastewater Engineering Bureau, at (603) 271-3503 or check the NHDES website at www.des.nh.gov (look for Wastewater Engineering Bureau in the A-Z list)
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As space allows, a company logo will be included—please email the logo as a JPEG or PNG file. (NO PDFs will be accepted)

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Company: ____________________________________________________________________

Telephone Number:________________________________________________________________

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DEADLINE: This application and payment must be returned no later than February 1st, 2014.
“Okay, I’m ready for my close-up.”