2004 NHWPCA Outing – Thanks again to Rick Seymour and his crew!

2004 NHWPCA Scholarship Awards

Two college bound New Hampshire high school seniors have each been awarded a scholarship of $1,000.00. This years awards go to Katie Gilbert of Henniker and Elisha Greenleaf of Claremont. These two young students submitted excellent essays stating their goals and achievements in the environmental areas.

By the way, Keith Gilbert and Arnold Greenleaf, NHWPCA members are also quite proud of these particular students.

Durham WWTF Upgrade
Screenings/Grit Building
Bankruptcy and Bonding – See article inside

NH Trade Show and Exposition Set for November 10th!

The 2004 NH Drinking Water Exposition and Trade Show co-sponsored by the New Hampshire Water Works Association and the New Hampshire Department of Environmental Services with supportive funding from the USEPA will be held on Wednesday, November 10, 2004. The annual event will take place at the Center of New Hampshire on Elm Street in Manchester.

NHWWA anticipates that over 150 vendors will exhibit their products and talk about their services. Product demonstrations will also be held in the Exposition Hall. Close to three dozen 30 minute seminars are scheduled to take place with topics to include: security issues, source assessment, aquatic weeds issues, distribution topics and much more!

This event is designed for operators, managers, water commissioners, system owners, engineers, consultants, and other professionals, and all those interested in drinking water issues, products and services. Exhibitors are very excited about displaying and talking about their proven products and services, as well as new and innovative products and services. Speakers are looking forward to telling you about important water works issues of the day.

As always, operators will be awarded continuing education credits for attending seminars, and also for attending Expo demonstrations.

If you are interested in exhibiting your product or service line and would like to secure your booth, or if you have any questions, contact Patricia Beavers, EXPO Coordinator, at (802) 763-3937.
Oxidation / Reduction Potential
The World Below D.O. - 0.0

by Tom White

It seems now that activated sludge systems are utilizing various zones of low or no oxygen levels – a technology and meter called O.R.P. - Oxidation Reduction Potential - can be very useful in process control. The meter and field probe are easier to use than your D.O. meter and require little calibration. The meter will give you a positive or a negative number in millivolts depending partially on the presence of oxygen or not. More on the O.R.P. meter and how the readings relate to activated sludge and sewage influents later.

A brief primer on simple chemistry will help us to understand the oxidation - reduction numbers you get at your WWTF. Equations in chemistry are balanced by a method of oxidation - reduction. Simply stated, an oxidation reaction is a reaction in which atoms or ions undergo changes in electron structure. The chemical equation may become balanced - equal positive and negative charges - same number of electrons gained and lost.

Wastewater – a combination of bacteria and organics partially digested, nutrients, chemicals of all sorts, metals and ions, etc. is a giant pot of chemical reactions happening and waiting to happen. Wastewater has a host of constituents that are being oxidized and reduced simultaneously. The O.R.P. electrode is reading the concentration and activity of all participating reactions in solutions. Every waste-water being unique in make-up makes it necessary to determine your own O.R.P. numbers experimentally.

Temperature compensation does not occur with O.R.P. meters because each reaction would have a different correction factor. pH can have a drastic effect on the O.R.P. measurement as well.

By understanding the complexity of what the O.R.P. probe is measuring, be very reluctant to accept textbook ranges that you should be observing in your plant.

Based on this information, you may change the O.R.P. number throughout your activated sludge flow train depending on any oxidants or reductants you may add intentionally or with side streams. Oxygen is the oxidant of choice in activated sludge and we all add this to our aeration basins to push the oxidation-reduction reactions toward the more stable side - aerobic oxidation.

The Anaerobic World - the dark side for many operators.

No dissolved oxygen, septic conditions, and odors have historically been feared by many plant operators and now we are being asked to operate our WWTF's with anoxic and anaerobic zones. The oxidation-reduction (O.R.P) probe will give you a number on the negative side giving you information on just how septic things are or in some cases - how oxygen deficient the M.L.S.S. is.

How useful can O.R.P. maybe be:

Aeration Tanks – to indicate the rate of oxidation along the length of the tank.
- compare O.R.P. numbers to oxygen uptake rates (O.U.R.) and to microbes you are growing at the time. - filaments relate O.R.P. numbers to some types.
- determine required Aeration Detention Time based on O.R.P. number - high rate oxidation - low detention time will yield low or negative O.R.P. numbers in aeration - incomplete oxidation - higher BOD.
- longer Aeration Detention Time - more complete oxidation possibly nitrification will yield very high positive O.R.P. numbers, lower BOD.
- shock load in aeration would result in a drastic change in O.R.P. number - could go either way - up or down. Side streams may show up as lowered or negative O.R.P. number - oxygen demanding.

Influent Sewage and Pump Stations – O.R.P. could be used to indicate septicity in the collection system and odor potential at various locations or shock loads. You must establish your own baseline of data.

Infiltration and Inflow – O.R.P. numbers could be used here to indicate where high negative O.R.P. numbers swing back to zero or positive O.R.P. numbers due to infiltration and inflow.

Sludge Holding Tanks and Side Streams – O.R.P. number could indicate how septic the sludge may be. Very high negative numbers many indicate sludge drying problems or may affect the quantity of polymer or potassium permanganate you will be required to use.

My suggestion is to get Wes Ripple or myself to measure O.R.P. with our new probe at your facility – give us a call.
Record Keeping
by Tim Loftus

Most of us who work in the wastewater field know we need to keep records as part of our permit requirements. But with so many things to do during the day it seems hard to justify adding more record keeping to our schedules. So why do more than what is required? One reason is to evaluate trends or plant upsets so that you can maximize plant performance. You can also use relevant records to develop and maintain a preventative maintenance program. In both situations the little extra record keeping more than pays for itself in cost savings and increases overall plant and personnel efficiency.

Another reason is to protect yourself and your facility from unnecessary litigation and unjust claims. Odor problems, sewer backups, permit violations, work-related accidents are all events where proper resolution is dependent on clear and precise record keeping. Memories of events don’t count - only the records of these events and of your remedial actions do.

Use a bound notebook with numbered pages and use permanent ink for all record keeping. Never remove a page from the bound book. If you make any mistakes while writing, do not erase or use “white-out,” simply draw a line through the mistake and add your initials next to it. Always keep your records neat, organized, and secure.

For NPDES purposes, you must keep your monitoring records for three years. Most of your sludge monitoring records must be retained for five years or more. Details of these are outlined in Title 40 Code of Federal Regulations (40 CFR) part 122 and in 40 CFR part 503. Use common sense when dispensing old records. You should keep all records beyond the minimum retention time that will aid you in evaluating operating trends or in anything that is part of, or may be part of, litigation.

While it is in your best interests to keep records of all aspects of wastewater treatment and collection systems, the EPA expects you to keep certain monitoring records. These include recording the date, exact place, and time of sampling or measurements; individual who performed sampling or measurements; dates analyses were performed; individual who performed analysis; analytical techniques used; and the results of the analyses. EPA takes your records seriously. Any person who “falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required” may be fined up to ten thousand dollars and spend two years in jail. And that’s just the beginning. It gets worse from there. Never cook the books.

Also, be aware that many errors that occur in record keeping happen when transferring data. Be consistent with labels. Use the same symbols, abbreviations, or names for a sample from collection to the final report. A problem I’ve experienced started with a sample bottle labeled “underflow” for the gravity belt underflow sample. On the lab TSS calculation sheet it is listed as “BTU” for Belt Underflow. The result was transferred to “Underflow - TSS” in the lab log, and finally the result is entered into the computer program under the heading “Supnt TSS.” Different departments in the facility had their own code system for record keeping. The problem was that one sample type had four different names. Being consistent in your labeling will not only aid you in reducing data transfer errors, it will help regulatory inspectors navigate through your records.

Another source of errors occurs when measurement units must be changed. Results for metals, for example, are often reported in lab reports as mg/L, but your regulatory agency may require you to report these in your NPDES permit as ug/L. It can look like there is a violation when there is none. Always double check the units you must report on.

Finally, be consistent in the order in which data is recorded or transferred. For instance, if you must transfer the results of ammonia, TKN, nitrate, and nitrate from the lab log to a data acquisition computer program, make sure both the log and computer program list these nitrogen species in the same order. Otherwise it is too easy to switch results around, especially when you are hurrying to get the data transferred before the end of the work day.

The information in this article is very general. As usual, check your federal, state, and local regulations. You may have additional regulations or requirements that you must meet.

If you have any questions, suggestions, or comments, please contact NEWA Lab Practices Committee Chair Phyllis Arnold Rand at (207) 782-0917 (prand@lawpca.org) or Tim Loftus at (508) 949-3865 (timloftus@msn.com).
Bankruptcy and Bonding Company
Add New Dimensions to Durham’s
Wastewater Treatment Facility Improvements Project

by Peter C. Atherton, P.E.,
Vice President, Wright-Pierce

Last October, “The Collector” featured an article on the recent and ongoing improvements to the Town of Durham’s Wastewater Treatment Facility. Leading up to last October, and with substantial completion slated for the end of December, it was hoped that the “Phase 2 - Baseline Improvements Project” would soon be completed (see end of article for description). Unfortunately, by the end of October, and despite proactive efforts by both the Town and Wright-Pierce to help keep the project on track, it was clear that the project would not soon be completed, and that the path to completion would be one not so frequently taken in New Hampshire.

A New Beginning
Toward the end of October 2003, following several unsuccessful attempts to bring the Town’s second upgraded final clarifier on-line, and with the overall project still less than 50 percent complete, the project’s General Contractor (also referred to herein as Contractor) filed for bankruptcy and abruptly abandoned the site. In addition to leaving the Town just one operable final clarifier, when historically both of the Town’s two clarifiers had been needed to treat flows and loadings, the Town was left with the following:

- Site and safety hazards (open excavations, improper grading, open conduits and open building penetrations, limited access to process and electrical equipment);
- Incomplete process and building systems (sludge pumping and heating/ventilation);
- Off-line treatment systems without temporary treatment facilities (septage, grit); and
- Several other conditions that could have lead to damage and/or inability of treatment processes to perform, particularly with winter fast approaching. Immediately, and then over the next several months, many meetings and strategy sessions were held between Town representatives and Wright-Pierce, and subsequently with the Contractor’s bonding company (i.e., surety) to discuss options available and to determine the steps needed to move the project forward.

The purpose of this article is to highlight some of these steps and many of the new dimensions added to the project as a result of the Contractor’s bankruptcy. However, prior to highlighting these, it is important to provide some background on the project and highlight some of the many steps taken by the Town and Wright-Pierce throughout the construction period to proactively manage the project and, ultimately, to help protect the Town’s interests.

Project Background
During the design phase, the Contract Documents were specifically developed to allow for key elements of the project to be completed prior to the time the University of New Hampshire (UNH) was to begin its Fall Semester in September 2003. At the same time, the contract was developed to upgrade failing equipment systems as quickly as reasonably possible and to minimize construction related disruptions on-site. This approach was reflected in the project’s schedule which included; bidding the project in late summer 2002 to allow for the selected contractor to be “under contract” by the fall, and use of the next several months to initiate and largely complete the shop drawing process prior to an early spring site mobilization date. In all, the contract period allowed 13 months for substantial completion, but given the nature of the project (i.e., several relatively discrete upgrade projects requiring equipment with significant lead times), restricted the Contractor’s time on-site to 10 months. Once on-site, there were interim milestones to complete the following:

- New plant water system and new thickened sludge pumps to be completed by the end of May 2003; and
- New headworks with new grit removal and screenings equipment and upgraded final clarifiers to be completed by the end of August 2003.

In addition, due to a recent failure of one of the Town’s return activated sludge (RAS) pumps, the Contractor also agreed at the start of the project to expedite that equipment system.

Completing the plant water system and the thickened sludge pumps upgrade by the end of May was required to provide the Town and Wright-Pierce something of a “comfort factor” given the state of the exist
ing equipment systems and their vital role in operating the facility. In addition, given the significant increases in flows and loadings that would require treatment when the Fall Semester at UNH began in September, it was felt that having the new headworks and both upgraded final clarifiers on-line was critical. This was particularly the case given the fact that both the former headworks and each of the existing final clarifiers needed to be fully taken off-line prior to September to allow for demolition and new construction.

Pre-Bankruptcy Project Management

In the months leading up to the Contractor’s bankruptcy, there were several “signs” that helped craft how the project’s construction phase was administered. In fact, some signs were even evident during the beginning stages of the project. A number of these signs were as follows:

- Contractor requested delay in site mobilization;
- Submission of incomplete and delayed shop drawings;
- Delays in mobilizing the site by the renegotiated mobilization date;
- Observed “problems” the Contractor appeared to be having completing other projects;
- Limited size of the Contractor’s on-site work crews;
- Change over in the Contractor’s management and administrative staff;
- Missed interim milestones;
- Monthly “challenges” coming to terms on requested payment requisition amounts;
- Payment issues associated with subcontractors and suppliers;
- Departure of several of the Contractor’s key employees (both office and on-site employees) directly involved with the project; and
- Contractor’s continued contention that, despite the above, the project would still be completed on time.

At the time each of these items was occurring, they were discussed with the Town and appropriately documented in project correspondence. The purpose of doing so was two fold. First, it provided an opportunity for direct dialogue with the Contractor on key matters while clearly reiterating project requirements and expectations. Second, it provided documentation of these key events to protect the Town’s interests should the Contractor’s obligations not be met. It should also be noted that, key provisions of NHDES’ standard construction contract documents were beneficial in helping to protect what was considered the Town’s best interests during construction, particularly with respect to: provisions to limit payment for stored materials; the ability to request lien waivers or similar “proof of payments” to subcontractors and suppliers; and ability to maintain the collection of retainage throughout the contract, just to name a few.

When it seemed evident that the project would not be completed on time, despite what was reported at construction meetings and on updated construction schedules, etc., specific questions were posed to the Contractor’s key principals. Based on the information shared, inquiries were also made to the Contractor’s surety to confirm and/or find out more about the ability of the Contractor to perform its contractual obligations.

It was soon thereafter, following another failed attempt to bring the Town’s second final clarifier online in late October, that the Contractor’s crew informed the Town and Wright-Pierce personnel on-site that they would not be back.

Post-Bankruptcy Project Management

Once the bankruptcy had appeared to occur, there was a noteworthy “silence” surrounding the matter. The Town was never officially advised by the Contractor that bankruptcy was either about to be or was filed. In addition, the surety was no longer able to discuss the project until it (the surety) had determined whether there had been a default and, if so, whether it had an obligation to perform as a result of the default. At this time, the Town and Wright-Pierce performed its own investigation into the matter, and initiated an official request that the surety become involved to immediately begin performing the remaining contractual obligations of the defaulted Contractor.

At the same time, in order to allow for the surety to begin performing its obligations, the Town needed to begin the process of terminating the contract with the bankrupt Contractor. Once terminated, the Town needed to secure a release of the contract from the bankruptcy court. Although not specifically summarized herein, close coordination between the Town, its legal council and Wright-Pierce was needed on the many technical, contractual and legal matters associated with these actions.

A general summary of the events that have transpired over the past 8 or so months since the former Contractor’s bankruptcy is provided below.

- Once the terminated contract was released from bankruptcy court the surety had determined that it was obligated to and was willing to perform the remaining contractual obligations via the Performance
Bond, the Town decided to have the surety take over the project versus town receiving a settlement and performing those duties itself.

- Surety decided to re-bid remaining project work versus negotiating directly with another contractor.
- Surety initiated a process to ratify the majority of subcontracts and purchase orders with suppliers to continue to work on the project and handle any past payment issues associated with Payment Bond.
- After many meetings and discussions, the surety and the Town could not agree on all financial terms associated with completing the project, and, in order to keep the project moving forward, both parties "agreed to disagree" on such matters until the project approached completion.
- Even though the surety is bound to complete the project as per the original Contract Documents, the details associated with the surety's take over of the project were summarized in a separate agreement with the Town (referred to as a Takeover Agreement).
- The surety, officially the new General Contractor, hired its own Contractor (referred to as the Completion Contractor) to complete the work. The surety has a separate agreement with the Completion Contractor to complete the project in accordance with the Contract Documents, as well as address defective work and other specific matters.
- Remobilization of the site began in February 2004, and the target substantial completion date was set for the end of June 2004.
- The surety's selected Completion Contractor has proved competent, but has been hampered by both patent (previously known) and latent (previously unknown) defects in the former Contractor's work, and, as a result, substantial completion is not likely until sometime in August 2004.

Closing Remarks

As one could imagine, getting to this point in the project has required close coordination with and the significant involvement of many Town officials, including the Town's WWTF staff; Town Engineer; Public Works Director; Business Manager; Town Administrator and legal council. Unfortunately, as work still remains, more involvement will be required in order to successfully complete this project.

In the meantime, the Town has been successful to date in proactively working through the surety to complete construction of the project. The Town has also successfully utilized NHDES provisions in the Contract Documents to continue to collect additional retainage for work completed and also assess and collect liquidated damages periodically to help address the many additional costs being incurred as a result of project delays and the former Contractor's default. It is also important to note that despite the previous and ongoing issues associated with construction, the Town's WWTF staff have continued to meet the plant's discharge permit requirements. This is in large part due to the skills of the Town's staff and positive outlook held throughout the construction period.

On a technical design basis during the past 8 months or so, the aeration tank selector, provided as part of the "Phase 1 - Immediate Improvement Project" in 2001, has continued to significantly minimize the growth of filamentous bacteria that had historically plagued WWTF operations. In addition, the performance of the one operable final clarifier, upgraded with a new suction header type sludge collection system and density current baffles, has been impressive, resulting in significantly thicker return and waste activated sludge and much improved solids retention during periods of high flows.

Phase 2 - Baseline Improvements Project

The major components being upgraded under the Phase 2 - Baseline Improvements project include:
- New fine screening and wash press facilities creatively housed within an expanded Headworks built on top of existing grit tanks;
- Upgraded aerated grit chamber featuring new aerated grit chamber blower, grit transport screw, grit pump, and grit dewatering classifier/concentrator;
- New odor control units for headworks area, septage holding tank and sludge dewatering area;
- New septage pump, septage holding tank modifications, and process controls;
- Improvements to the primary clarifiers;
- New dissolved oxygen control system for the aeration tanks;
- New flow splitting structure to improve flow distribution to final clarifiers;
- New final clarifier mechanisms and return activated sludge pumps;
- Disinfection system improvements;
- New plant water system;
- Various architectural and ventilation system modifications;
- New SCADA System; and
- New electrical power distribution facilities.
The Phase 2 project was originally awarded for $2.4M in 2002.

The Phase 2 project was developed based on wastewater facilities planning completed for the Town of Wright-Pierce from 1998-2000. The approved facilities plan recommended a phased approach to implementing needed treatment facility improvements. Phase 1 dealt with “Immediate Improvements” including the design and construction of a “selector” to improve the plant’s activated sludge system. Phase 2 of this project, termed “Baseline Improvements”, dealt with specific process system upgrades needed to continue to consistently meet present treatment require-ments. At the same time, the improvements are designed to improve overall treatment efficiency and performance. Phase 3 will address the future more stringent discharge requirements that will ultimately be imposed. These future improvements will build upon the improvements implemented as part of the first two phases.

The Town’s wastewater treatment facility (WWTF) serves the Town of Durham and the University of New Hampshire. The rated capacity of the facility is 2.5 mgd. Average flows range from less than 1 million gallons per day (mgd) during summer periods to greater than 1.5 mgd during non-summer periods.
pH Effluent Limitations Under Continuous Monitoring
– 40 CFR-Chap 1, Part 401-17

information provided by Tom Croteau – NHDES

(a) Where a permittee continuously measures the pH of wastewater pursuant to a requirement or option in a National Pollutant Discharge Elimination System (NPDES) permit issued pursuant to section 402 of the Act, the permittee shall maintain the pH of such wastewater within the range set forth in the applicable effluent limitations guidelines, except excursions from the range are permitted subject to the following limitations:

(1) The total time during which the pH values are outside the required range of pH values shall not exceed 72 hours and 26 minutes in any calendar month; and

(2) No individual excursion from the range of pH values shall exceed 60 minutes.

(b) The Director, as defined in §122.3 of this chapter, may adjust the requirements set forth in paragraph (a) of this section with respect to the length of individual excursions from the range of pH values, if a different period of time is appropriate based upon the treatment system, plant configuration or other technical factors.

(c) For purposes of this section, an excursion is an unintentional and temporary incident in which the pH values of discharge wastewater exceeds the range set forth in the applicable effluent limitations guidelines. (Secs. 301, 304, 306 and 501 of the Clean Water Act [the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1251 et. seq., as amended by the Clean Water Act of 1977, Pub. L. 95-217]).