Looking back on my involvement with the NHWPCA, I cannot believe how fast time flies by. I began by manning a trade show booth at the “Center of New Hampshire’s” Armory Building back in 1986. I still remember the “fun” we had searching out a suitable parking spot without getting a ticket by the end of day. This was prior to the change in our constitution that allowed me to work my way “through the ranks” and become a full board member. I appreciate the opportunity and take this position very seriously.

I am the first “vendor” to ascend to the president level, I’m sure not the last. It is a good thing to rotate the responsibilities through different people approaching challenges from varying perspectives. I may offer a unique view of the importance of the NHWPCA to the Waste Water Treatment field, I may not. I’ll give it my best shot, as will my counterparts. The board is made up of a talented and diverse group, tempting to make this association work better for everyone.

There are two areas of concern I am going to address during my year as Pre. First and foremost; improving the communication to the members. Tom White does an excellent job with the Newsletter, this will continue. We need to address the members on a monthly basis (minimum) in other areas. I believe the tool to accomplish this is the Internet. Currently, we have approximately one third of our database with e-mail addresses; we are not certain which ones are current. You will soon be solicited for an e-mail address on which we can contact you. This is not limited to your place of employment. We want to know where we can reach you most conveniently. We have already taken a step in the right direction. Wes Ripple has been instrumental in organizing a committee of interested individuals to address some concerns with the NHWPCA’s direction. During the last board meeting we voted to change the “Internet” Committee to the “Communication” Committee. The sole purpose of this group is to improve the information flow to the members. There are many events sponsored by the NHWPCA during the year, most involve training others more social. Our organization is fortunate to have one of the most active training programs in New England, we want everyone to be aware of the opportunities and participate.

Secondly: I am going to stand up on my “soap box” for the vendors. The Trade Show is upcoming on April 15th. This is a very important fundraiser for our organization. Participation/attendance from the operators is key to the success of this endeavor. In general, attendance at this type of forum has been on the decline. We have changed our venue to the Sheraton Tara in Nashua for 2005 and added an awards luncheon. There will be training sessions, vendor tables, refreshments, and we need you! Please plan on attending, and participating, this year. The vendors should be a source of information to you. Bring them your problems and expect answers. If you are not satisfied call someone else. These individuals should help you solve problems, not create (sell you) new ones. Along these lines we hope to add a “message board” to our web page to assist with this process.

In closing; improving the communication flow is key. We will have some new tools in place; we need to hear from you!
MAURICE GAUTHIER  
Long Time Fellow WWTF Operator  
1951 – 2004


He was born in Lowell, MA on Jan. 21, 1951 the son of Philippe M. and Rita (Bergeron) Gauthier. Moe was raised in Tyngsboro, MA and graduated from Keith Academy in Lowell in 1969. He later graduated from Middlesex Community College in Bedford, MA and also received a degree from the NH Tech. Inst. in Concord, NH.

Several years ago, he worked at Wannalancett Textiles in Lowell. He then was employed with Ted Larter at Franklin and assisted in maintenance and rebuilding of several hydroelectric dams in the area. Mr. Gauthier also worked for the State of NH at the Franklin Wastewater Treatment Plant. He was then employed by Plymouth Regional Wastewater Treatment Facility and was currently employed by the City of Manchester at the wastewater treatment facility.

While in Franklin, Moe was involved with the Boy Scouts and the Franklin Little League. He was a communicant of his Church and was a member of the Church Choir, taught Religious Education, served on the Pastoral Committee, and was active in several other ways. Moe was a member of the Bishop Leo O’Neil Knights of Columbus Council.

Family members include 2 sons: Benjamin F. Gauthier and Zachary J. Gauthier, both of Franklin, 2 sisters: Phyllis Hennessey of St. Albans, Maine, and Jacqueline M. Gauthier of Tyngsboro, MA, a brother: George A. Gauthier and his former wife, Heidi (Harris) Gauthier of Franklin, and nieces, nephews and cousins.

Moe was considered by his fellow wastewater operators to be very knowledgeable in particular in the maintenance of WWTF’s. Moe worked his way up through the ranks, worked on many committees of the NHWPCA and also served the Association as President of NHWPCA. We all miss Moe.
8:30 am – 1:00 pm  
**Exhibits Open** 0.2 CEU for all NHWPCA members attending

Displays of the latest environmental products and professional services in the Wastewater Treatment Industry will be open for viewing. There will be no charge for entry into the Exhibit Hall. Complimentary coffee will be served in the exhibit hall until 11:00 AM, at which time a cash bar opens. Please register to join us for lunch by completing and returning the enclosed form with payment.

**TECHNICAL SESSIONS:** 0.1 CEU awarded for each session to anyone attending

**9:30 AM – 10:30 AM**  
**U.V. Disinfection Pilot Results**  
*Presented by Ed Rushbrook, P.E. and David Mercier, P.E. ~ Underwood Engineers*

The results of an extensive UV disinfection pilot performed at the Hanover, NH wastewater treatment facility will be presented. The pilot closely evaluated the impact of varying wastewater effluent quality on the effectiveness of disinfection as well as operational aspects such as the need for hand cleaning. The results of the pilot led to Hanover converting from UV to chlorination/dechlorination for a disinfection process. The results of the pilot point out the importance of evaluating potential impacts of parameters affecting UV disinfection that are often overlooked. This session should be of interest to treatment plants currently using UV disinfection or considering the use of UV disinfection in the future. Question and answer period to follow.

**11:00 AM**  
Cash bar opens

**11:00 AM – 12:00 PM**  
**Buying Polymer in Today's Market**  
*Presented by Randy Homan*

This session will be an informative, behind-the-scenes look at the polymer industry. The nationwide shortage of polymer supply figures predominantly in this discussion. We will discuss the most efficient ways facilities can purchase polymers in a changing market by organizing and prioritizing their buying criteria to filter out the suppliers who do not meet their needs. Various tools and techniques will be presented that enable the end user to be more proactive in ensuring they receive what they want, when they want it, in the quantity that they want and at the price to which they agreed. The focus of this session will be the question and answer period where everyone is encouraged to not only ask questions but also to contribute their ideas and thoughts.

**12:15 PM**  
A raffle to benefit your Operations Challenge team will be held in the Exhibit area.  
A/D Instruments has donated 2 tickets to NH International Speedway. Only operators will be eligible to win these tickets. Get your raffle tickets early!!

**1:00 PM**  
Formal Luncheon – Please complete registration form and return with payment.  
Featuring: a New England buffet to include: chowder, salad, herb crusted chicken breast, assorted sides and delicious desserts.

**1:30 PM**  
Awards Ceremony

**Clean Water Week Poster Contest Awards**  
The Governor of NH, John Lynch, has been invited to present these awards.

**New England Water Environment Association Awards**  
*Presented by Phyllis Rand, Vice - President  
~ New England Water Environment Association*
Small Wastewater Plants, Big Dilemma . . . Sludge, umm, What is it Good For?

by Tom White

The Wastewater Wizard is back looking into the Clean Water Crystal Ball – spinning the Ball to rotate counter clockwise as the toilet flushes and chants: Sewage to treat, Bugs to grow the Sludge to eat, Sludge to waste, Sludge to thicken, Sludge to smell the odor to sicken, Sludge to store, Sludge to dry, Sludge to compost for someone to buy, Sludge to truck, Biosolids to truck, regulations to meet, good luck. CLEAN WATER TO MAKE, CLEAN WATER TO MAKE.

A murky picture develops slowly in the Crystal Ball – an older operator without much hair studying the sludge commodities market on the plant computer – here today gone tomorrow – a risky market when there is a market at all. Other operators who appear in the Ball seem to be stressing over sludge – “damn, I overfilled the sludge holding tank and then the truck. I thickened the sludge so well that now it will not pump. This sludge won’t settle or thicken – filaments – I cannot even decant. I am trucking slop and paying good money for it.”

Many of the smaller activated sludge plants in New Hampshire have reached their limit on sludge holding and trucking capabilities at their plants and the budgets fall far short when it comes to sludge. Most of these facilities were designed and built in the seventies when wasting sludge was to simply just follow the arrow on the plant drawings – that is truck it to the landfill. Often dry or semi liquid sludge was deposited there. Now that landfills have mostly closed, many wastewater superintendents, and operators, are stressing over not having enough sludge disposal options and the associated costs of sludge disposal. Couple this with the task of having to operate outdated, worn out equipment and trying to convince sewer commissioners and selectmen to make decisions to part with more money. Meanwhile at the WWTF solids are backing up in sludge holding tanks, in off line ditches and tanks, in on line tanks carrying to much MLSS, and sometimes in semi dry piles stored on site. Many facilities are forced to operate their activated sludge process with high MCRT’s because there is nowhere to waste to. Winter is sludge storage time and the spring hydraulics are coming and fear levels are rising among the operators. Filamentous bacteria in the mixed liquor are thriving and sludge settling is poor.

Process control dictates that thinning out the filaments is the only way to improve the settling but more wasting requires sludge storage and trucking – sometimes not an option.

This creates a gloomy picture and quite a challenge for these small plants and the solution requires a sharp operator with a clear mind, time to think, and persistence and persuasion to solve the sludge riddle. The first step toward easing the pressure is to create a good Sludge Handling and Disposal Plan specific for your WWTF. Two key elements in any good plan would be flexibility and options. These key elements would allow the operator to reduce excessive system sludge and stress on the operator as well. Options that allow you to waste at will to regain control of your activated sludge process, to store liquid and/or dry sludge on site for a month or longer. Options that would be temporary and affordable but will fit into a long term sludge plan. Imagine including in the options time for sick and annual leave of the staff and for equipment down time. A temporary low cost plan that has the flexibility to eventually evolve into a full scale plan with options and room for WWTF plant growth.

Enter – Freeze Dried Sludge. Cold Regions Research Lab in Hanover, years ago, performed and published studies on the effects of freeze thaw cycles on wastewater sludge. The physics that works in separating the water from the sludge is basically that frozen water molecules form ice crystals and this process separates the liquid from the sludge solids. When this frozen sludge then thaws out the frozen water crystals melt and drain off easily because the bond with the solids has been broken. A little like the way polymer works. Sand sludge drying beds have always worked this way in freezing cold weather. The water needs to be able to drain easily from the sludge and the result can yield sludge cakes of up to 50% dry solids depending upon the type of sludge and the weather conditions.

Sludge drying bags utilize this process of drying. They come in many large sizes and are made up of a rugged material that is weaved to allow water to drain out of the bag easily but not allow water back into the bag. The bags have been used in agriculture for years and are now being used to store and dry sludge outdoors. The bags can fit into old sand sludge drying
beds or into any tank with under drains and they can be intermittently filled with waste sludge with polymer added for initial flocculation and draining. Eventually, the hydraulic head in the bag or any external pressure placed on the bag will assist in the dewatering process. Factors like good drainage and air current around the bag, sunshine, air temperature, and heat and humidity will affect the rate of sludge drying in the bag. Rain events will not rewet the drying sludge as it did in the case of uncovered sand drying beds. This bag drying process achieves much thicker sludge slurries than what could be achieved by storing and decanting the same sludge in holding tanks. This fact will allow you to store much larger volumes of wasted sludge over time. Remember this simple principle — double the percent solids in your sludge and you half the storage space required to store the sludge or the sludge cake. When winter does arrive the freezing and eventual thawing of the sludge in the bags will result in a second large release of water from the bag upon sludge thawing. The ice crystals melt and water will drain away from the solids resulting in drier cake in the bag then most automated drying equipment can achieve – maybe between 35% to 50% dry cake solids in the bag after spring.

This whole sludge bag drying process needs to be designed with flexibility and options to allow you to waste daily with polymer to active bags. Other bags will be down the line in the drying process and the final dried bags will need to be removed or emptied. Remember that the serious drying or dewatering does not occur until after a winter of freezing and thawing the bags, therefore at least one winter is required. Early results in New Hampshire indicate that the sludge that is finally removed from the bags has little to no odor and looks like compost. Microbes and bacteria are killed by the freezing process. No high temperatures or chemicals, except polymer, are added to stabilize the sludge. In fact, early test results indicate that it may pass the testing requirements to be a Class A Biosolids except for the vector attraction requirement. Mixing wood ash or lime with the sludge in the end would meet this requirement if needed.

Plants that are presently using the large sludge bags for sludge storage and drying are the Newport WWTF where Arnold Greenleaf has filled many bags by stacking one on top of the other as he dewatered the sludge from his primary lagoon. Arnold has achieved sludge cake dryness of over 45% right out of the bag and has saved the Town very much money by pumping and drying the lagoon sludge in the bags instead of paying big bucks to a contractor to accomplish this. Terry Welch decided to try out the bags at the activated sludge WWTF in Woodstock. Terry placed his bags right onto the old sand sludge drying beds and happily wasted sludge into them allowing him to lower his MLSS to levels he could run the plant at to avoid poorly settling sludge and possible violations. The Town of Sunapee, Dave Brennan Superintendent, is studying the bag system and wants to retrofit bags into his old sand beds. Also, the Town of Woodsville, Pat Butler Superintendent and Ed Mosher Plant Operator, are considering using the sludge bags. Pat already has options by using a combination of a belt press and reed beds to store and dry sludge but would like to add the option of sludge bags as well. Pat knows it is important to have choices when dealing with sludge.

In summary, it appears that for the many small WWTF in New Hampshire that are stressing over sludge issues that a Sludge Handling and Disposal Plan that utilizes the sludge bags should be considered. Just call up any of the operators mentioned above to get the straight poop.
Michael Gerardi Wastewater Biology Training Seminar

on
The Activated Sludge Process

The New Hampshire Water Pollution Control Association (NHWPCA) is sponsoring a one day, training seminar presented by Michael H. Gerardi through his company, Water Pollution Biology. Mr. Gerardi develops and presents wastewater biology courses throughout the country for Penn State University and through private contract. He has authored numerous articles and technical publications such as “Nitrification and Denitrification in the Activated Sludge Process” as well as serving as chairperson for several Water Environment Federation specialty publications. Mr. Gerardi is one of the foremost authorities on wastewater biology in the country today.

He will present a total of 6 hours of instruction on the Activated Sludge Process. This seminar is sure to have something for everyone. It will describe how the process functions in terms of removing cBOD, nBOD, fine solids and heavy metals. Operators will learn how to recognize and control heavy metal toxicity. The roles and the significance of the various types of bacteria, protozoa and metazoan will be presented. Operational conditions affecting floc formation such as sludge age, pH, temperature, oxygen requirements and the reasons for filamentous bacteria overgrowth will be discussed. Nutrient needs will be evaluated as well as correcting nutrient deficiencies. There will also be a discussion on applications of bioaugmentation through the addition of commercially prepared bacterial cultures.

This seminar will be held on Monday, May 16, 2005 at the New Hampshire Department of Environmental Services auditorium in Concord, NH. Registration will begin at 8:00 AM. Seminar hours will be from 8:30 – 4:00. The cost will be $60 for NHWPCA members and $85 for non-members. 0.6 CEU’s will be awarded to participants. For additional details and registration information call Wes Ripple at 603-271-2940 or Mary Jane Meier at 603-271-5553. E-mail questions can be sent to wripple@des.state.nh.us or mmeier@des.state.nh.us. Registration deadline is April 27, 2005.

Crystal Crucible Society (C²)
Call for Nominations

The NEWEA Laboratory Practices Committee is currently accepting nominations for the Crystal Crucible Society Recognition Program. This program recognizes and honors individuals for their outstanding contributions that promote increased professionalism in the wastewater laboratory field. Nominees are not required to be NEWEA members. Examples of outstanding contributions are listed below:

*Significant, active participation in one or more of the following areas:
  Wastewater related Analysis, Education, Training, Safety, Certification, Management or Planning.
  *Involvement in promoting the professional recognition of the wastewater analysis profession.
  *Active participation in the NEWEA Laboratory Practices Committee.
  *Papers or articles related to the wastewater analysis professions that have been accepted by state, regional, or national publications.
  *Technical presentations at professional conferences
  *Active participation in the WEF Laboratory Practices Committee.

Nominations must be submitted in writing by June 1, 2005 to: NEWEA, Attn: Tim Loftus (LPC Chair) 100 Tower Office Park, Suite K, Woburn, MA 01801.

For further information and to obtain nomination forms, contact LPC Chair Tim Loftus at (508) 949-3865 timloftus@msn.com or the NEWEA office at (781) 939-0968, mail@newea.org, 100 Tower Office Park, Suite K, Woburn, MA 01801.

NEWEA Announces the Recipients of the Crystal Crucible (C²) Recognition Program

The C² program annually recognizes and honors individuals for their outstanding contributions that promote increased professionalism in the wastewater laboratory field.

The following recipients were inducted into the C² Society at the NEWEA 2005 Annual Conference in Boston, MA:

- Nancy McAuley-Lesieur
  of the Nashua WWTF, NH
- Cynthia Walters
  of the Narragansett Bay Commission, RI
- Paul Fitzgibbons
  of LIG Training Services, RI
- Colleen Spero
  of the Greater Lawrence Sanitary District, MA
- Tim Loftus
  of the Webster WWTP, MA

Each inductee received a NEWEA Crystal Crucible lapel pin and a certificate of recognition.
Total Residual Chlorine
by Tim Loftus

The Total Residual Chlorine measurement in your effluent hasn’t changed, but disinfection rates have dropped sending *E. coli* results over the permit limits. If the chlorine residual in the effluent produced good disinfection results one day, why not the next?

Determining the cause of this type of problem will require an understanding of what chlorine residual really is and what it is not. When we measure for Total Residual Chlorine (TRC) in wastewater we are not determining actual chlorine atom concentration in the way we would determine, for instance, copper concentration. The measure we make is more of a reactive form of chlorine concentration than anything specific.

Most treatment plants that disinfect the effluent by chlorination use either chlorine gas or the liquid sodium hypochlorite (a concentrated form of bleach). Chlorine is added and a percentage of that is deacti-vated by sunlight, reduced (a type of change in the chemical properties), converted to less active forms of chlorine by substances in the water, or is taken up in the disinfection mechanisms. Whatever uses up the chlorine to make it ineffective is called the chlorine demand. The remaining chlorine that has retained its disinfection properties is measured as the TRC.

Ideally once you can measure the TRC, however small the value, disinfection should be complete. But that’s not the way it works in reality. In practice an excess of reactive chlorine must be present in the effluent for disinfection to work to the level of NPDES requirements.

How much extra chlorine must be present? That depends on what chlorine compounds are available for disinfection. Sodium hypochlorite or chlorine gas is added to the effluent to produce hypochlorous acid (HOCl), hypochlorite ion (OCl⁻), and if gas is used, a small amount of dissolved gas (Cl₂). If you measure the free available chlorine you would be measuring the total of these three chemical species. At a pH of 7.3 there are roughly equal amounts of HOCl and OCl⁻. Less then pH 7.3 and HOCl is favored. Higher and OCl⁻ is favored. However, HOCl works much better as a disinfectant then OCl⁻.

Free available chlorine will also react with ammonia in wastewater to produce chloramines, collectively called combined available chlorine. Chloramines also have important disinfection properties in treatment plant effluents. And like the chlorine compounds that make up free available chlorine, some of the different chloramines that make up the combined available chlo-

---

PICTURE THE MONEY
by Tim Loftus

On the way home from the Annual Conference, three operators decided to stop in a backwoods pub and share a fifteen-dollar pitcher of beer. Each contributed their five-dollar share then sat down to determine which one of them got the most treasures from the exhibitor hall. A little while later the bartender realized that they had bought the beer during happy hour and should have charged them only eleven dollars, not fifteen. On the way to their table to give them their change, the bar-tender realized the $4.00 difference could not be easily divided three ways. So, since the operators didn’t know the real cost of the beer, the bartender decided to give each of them a dollar and keep the remaining dollar for himself. Now each of the operators paid four dollars for the beer, which makes the total of twelve dollars. The bartender kept one dollar. What happened to the other two dollars?

Answer: The perception that the sum should add up to fifteen dollars is incorrect. The three operators paid a total of twelve dollars, not fifteen. Therefore, the bartender kept one dollar as his commission.
Expanding to Meet Client Needs
Underwood Engineers ~ Concord Office ~

- Wastewater Facilities and Planning
- Solid Waste Facilities and Planning
- Water Facilities and Planning
- Storm Water Management
- Construction Services
- Roads and Bridges
- Site Planning
- Permitting

Quality and Professional Client Service

Underwood Engineers, Inc.
Civil–Environmental

25 Vaughan Mall, Unit 1, Portsmouth, New Hampshire 03801-4012 Tel: (603) 436-6192
99 North State St., 2nd Floor, Concord, New Hampshire 03301-4334 Tel: (603) 230-9898

50 Years in the Game

When you have a project that requires engineering, planning, landscape architecture or environmental science services, you need a consultant who will be your project team's most valuable player.

At Dufresne-Henry we have 50 years of experience in the game. Do you have a project in your future? Call a winning play...contact us at 603-669-8672, log on to our Web site at www.dufresne-henry.com, or call the Dufresne-Henry office nearest to you.

engineers . planners . landscape architects . environmental scientists


Celebrating 50 Years
Dufresne-Henry
Providing municipalities and industry with water and wastewater contract operations across the nation and proudly serving the New Hampshire communities of:

Ashland
Claremont
Lincoln
Littleton
Jaffrey

Aquarion Operating Company
15 Dartmouth Drive
Suite 300
Auburn, New Hampshire 03032
603-792-0000
www.aquarionops.com

We know water.
And it shows.

At Severn Trent Services, our focus on field testing of water and wastewater systems means that our recommendations are backed by solid, real world data. And we know what we’re doing. We have performed over 8,000 projects worldwide. From water system audits and hydraulic analysis to sewer system evaluations and specialty rehabilitation, you can rely on Severn Trent to provide you with expert solutions.

211 Gay Street
Manchester, NH 03103
603.625.1212
info@severntrentservices.com

www.severntrentservices.com
forsight
collaboration
know-how

- contract operations
- O&M assistance
- infrastructure improvements
- water and wastewater engineering
- energy and chemical optimization
- civil engineering
- solid and hazardous waste management
- information management/GIS

Serving New England for over 25 years
(800) 426-4262
www.woodardcurran.com

Weston & Sampson Engineers, Inc.
195 Hanover Street, Suite 28, Portsmouth, NH 03801
Tel: 603-431-3937 Fax: 603-433-4355
www.westonandsampson.com
OFFICES THROUGHOUT NEW ENGLAND

- Water
- Wastewater
- Stormwater
- Transportation
- Solid Waste
- Hazardous Waste
- Geotechnical Engineering
- Environmental Engineering
- Environmental Training
- Structural Design & Engineering
- Information Technology
- Construction Management
- Site Assessment & Remediation
- Landscape Architecture

Biosolids Recycling Services

- High Quality Turnkey Recycling Solutions for Biosolids (Class A and Class B)
- Lagoon Cleaning Solids Management and Solutions
- Septage, Sludge, and Industrial Solids Recycling Options
- Celebrating Our First Decade of Success - We are On A Roll!

Resource Management
Inc.
PO Box 1081 Ashland New Hampshire 03217
(603) 536-8900 www.RMI-recycles.com

SEA CONSULTANTS INC.
10 Ferry Street, Suite 137 Concord, NH 03301
phone: (603) 226-7000 fax: (603) 226-0999
email: concord@seacon.com
web: www.seacon.com

Down to Earth Recycling Solutions
Environmentally Sound Solutions
Wastewater Collection, Treatment & Disposal
Interceptor Microtunneling
CSO & SSO Management
Environmental Planning
Environmental Assessments
Industrial Waste Management
Permits Assistance & Coordination
Alternative Funding Strategies.

Hoyle, Tanner & Associates, Inc.
150 Dow Street • Manchester, NH 03101
tel 603-669-5555 • fax 603-669-4168
www.hoyletanner.com

We’ve got what you need
Call 1-800-EJP-24HR

Hydrants, valves, meters, pipe – if it goes into a water project, we can get it to you wherever and whenever you need it.

Water • Sewer • Drain • Gas

Laboratory Instruments: Service & Sales
- Autoclaves
- Ovens
- Microscopes
- Balances
- Turbidimeters
- pH Meters
- Chlorine Analyzers
- DO Meters
- Spectrophotometers
- Pressure Gauges
- Scales to 10,000 lbs.
- Conductivity Meters
- Weight Set Calibration
- Thermometer Calibration
- ISO 9001:2000 Registered

26 years of service to Maine, New Hampshire and Vermont.
Traceable standards used in all service work.
24 hour – 7 day emergency service

Fully Authorized YSI Sales & Service

QC Services, Inc.
PO Box 68, Harrison, ME 04040
Phone: 207-583-2980
Fax: 207-583-6936
E-mail: qcservices@cowi.net
www.qcservices-mains.com

BROWN AND CALDWELL
Environmental Engineering & Consulting

WATER/WASTEWATER TREATMENT
Business Consulting Services
Pipeline Infrastructure
Watershed Management
Environmental Services
Stormwater Management
Information Technology

Portland, ME • Methuen, MA • Middleborough, MA
40 Offices Nationwide
www.brownandcaldwell.com
<table>
<thead>
<tr>
<th>Date</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MARCH 30</td>
<td>Remedial Mathematics Review</td>
</tr>
<tr>
<td>APRIL 13</td>
<td>Advanced Instrumentation and Controls</td>
</tr>
<tr>
<td>APRIL 14</td>
<td>WWTP Budgeting: Strategies for Success</td>
</tr>
<tr>
<td>APRIL 15</td>
<td>NHWPCA Trade Fair at Nashua Sheraton</td>
</tr>
<tr>
<td>APRIL 19</td>
<td>Optimizing Sequencing Batch Reactor Performance at Pease Trade Port WWTF</td>
</tr>
<tr>
<td>APRIL 21</td>
<td>Pump Systems Optimization</td>
</tr>
<tr>
<td>MAY 4</td>
<td>Considerations in WWTF Upgrades</td>
</tr>
<tr>
<td>MAY 11</td>
<td>Maintenance of Conveyor Systems</td>
</tr>
<tr>
<td>MAY 16</td>
<td>The Activated Sludge Process Presentation by Michael Gerardi held at the DES Auditorium</td>
</tr>
<tr>
<td>MAY 18</td>
<td>Applied Wastewater Math Review</td>
</tr>
<tr>
<td>MAY 24</td>
<td>Introduction to Collection Systems</td>
</tr>
<tr>
<td>MAY 25</td>
<td>Collection System Safety- morning</td>
</tr>
<tr>
<td>MAY 25</td>
<td>NEWEA Collection System Exam- afternoon</td>
</tr>
<tr>
<td>JUNE 1</td>
<td>Activated Sludge Selector Technology</td>
</tr>
<tr>
<td>JUNE 15</td>
<td>CERTIFICATION EXAMS—ALL GRADES</td>
</tr>
<tr>
<td>JUNE 16</td>
<td>Security and Emergency Preparedness</td>
</tr>
<tr>
<td>JUNE 22</td>
<td>Discharge Monitoring Report Preparation</td>
</tr>
<tr>
<td>JUNE 24</td>
<td>Summer Outing- Ellacoya State Park, Gilford, NH</td>
</tr>
<tr>
<td>JUNE 29</td>
<td>Team Building</td>
</tr>
</tbody>
</table>

Notes: 1) All classes held at the Franklin Training Center unless otherwise noted
2) The Spring 2005 Training Announcement contains information on class costs and the associated Continuing Education Units along with Registration forms
3) Training Announcement will be mailed to municipal WWTFs
4) Individual mailing upon request by contacting Sarah Goyette at 603-271-2586, or via e-mail sgoyette@des.state.nh.us
5) To view and download the Training Announcement visit the NH DES website [http://www.des.state.nh.us/wwe/training.htm](http://www.des.state.nh.us/wwe/training.htm)
Residual Chlorine
by Tim Loftus

Whether you use chlorine gas or sodium hypochlorite to disinfect the wastewater, both have one thing in common – in solution they are reactive and very unstable. The chlorine wants to change from a high oxidizing level to a more stable reduced one. Because of this it is impossible to preserve a sample for residual chlorine. Any sample taken for residual chlorine analysis must be tested immediately. According to EPA, this means the sample must be tested within fifteen minutes of collection.

There are also other concerns when sampling for residual chlorine. Exposure to sunlight and sample agitation reduces the chlorine to ineffective forms. Additionally, a dirty sample collection bottle, whether glass or plastic, can create a chlorine demand. All these interferences will give you lower residual chlorine values than what may actually be present in the field. All of these interferences can also be avoided with proper sample collection and handling.

Oftentimes there may be other interferences that cannot be avoided. Oxidizing agents such as bromine in estuary and marine samples, oxidized forms of manganese as well as some other metals, peroxides, turbidity and color are often found in wastewaters at levels that will interfere with residual chlorine analyses. There are different methods used to analyze residual chlorine. Each method is subject to different interferences and detection limits. Choose a method that will most accurately measure residual chlorine at your plant based on your expected interferences and detection limits. Three of the most common methods used for residual chlorine analysis are listed below. These descriptions are very basic. Refer to the actual test methods listed in Chapter 40, Code of Federal Regulations, part 136, for a complete description of each procedure, reagents needed and potential interferences.

Amperometric titration

A sample is titrated with phenylarsine oxide (PAO). After the PAO reacts with chlorine and an excess of PAO becomes present, the electrical polarity of the solution changes. The point in the titration when this change in the electrical current happens, as measured by an ammeter, correlates to the chlorine concentration. This method requires a good deal of operator skill to produce reliable results. However, this method is not affected as much as the other methods by turbidity, color, manganese, and iron – all interferences in many types of wastewater.

Titrations that produce a color change

There are two basic titration procedures that are accepted for NPDES reporting. The first one involves titrating a sample with sodium thiosulfate and using starch as the indicator. The other one involves titrating with ferrous ammonium sulfate and using N,N-diethyl-p-phenylenediamine (DPD) as the indicator. In both methods a sample is titrated until a specific color change emerges. The amount of titrant used to the color change correlates to the amount of residual chlorine in the sample. Color and turbidity interfere with the titration end-point color. Different forms of metals and other oxidizing agents can produce a positive interference in these methods.

DPD Colorimetric

DPD is added to a sample and, through a series of reactions, a chemical is produced that is red in color. The color intensity correlates to the residual chlorine concentration. A spectrophotometer is used to measure this intensity of the red color. Sometimes, for a quick non-NPDES check, the sample’s color is compared to DPD- specific color wheel to determine chlorine concentration. This is the easiest method to use for analyzing residual chlorine. But it too is affected by a number of interferences, most notably color, turbidity, and oxidizing agents.

It’s important to use the proper residual chlorine test methods to avoid most, if not all, of the interferences that are found in wastewater. Accurate results aid in better control of your facility’s disinfection system, which will help in saving money (by not wasting disinfection chemicals), and in meeting your NPDES permit.

Even if your NPDES permit states which method to use for effluent residual chlorine analyses, you need to be familiar with the other methods, especially if you have an industrial pretreatment program. For example, when sampling an industry for cyanite you must test for residual chlorine before preservation. If any is found you must neutralize the chlorine with ascorbic acid. However, the residual chlorine method you use for your plant effluent may not give accurate results if applied to an industrial waste. A false residual chlorine reading in an industrial waste

Continued on page 16
A tool salesman walked into a treatment plant with a large supply of tool kits for sale. These tool kits came in many different models and, understandably, sold for different prices ranging from forty dollars to one hundred and twenty-five dollars, tax included. And they were such a good deal that some of the workers wanted to buy tool kits for themselves. One of the maintenance workers put a hundred-dollar bill down and the salesman asked which kit he’d like. After the transaction was made another worker gave the sales-

man a hundred dollars. Without asking, the salesman immediately gave this worker the same model tool kit that the first worker bought. How did the sales-

man know what model tool kit this second worker wanted?

"The assumption that too many smaller, inexpensive tool kits model many several bills totaling one hundred dollars. This indicates to the salesmen that the second worker gave the sales- men a hundred dollars. Without asking, the salesman immediately gave this worker the same model tool kit that the first worker bought. How did the sales-

man know what model tool kit this second worker wanted?"

A tool salesman walked into a treatment plant with a large supply of tool kits for sale. These tool kits came in many different models and, understandably, sold for different prices ranging from forty dollars to one hundred and twenty-five dollars, tax included. And they were such a good deal that some of the workers wanted to buy tool kits for themselves. One of the maintenance workers put a hundred-dollar bill down and the salesman asked which kit he’d like. After the transaction was made another worker gave the sales-

man a hundred dollars. Without asking, the salesman immediately gave this worker the same model tool kit that the first worker bought. How did the sales-

man know what model tool kit this second worker wanted?
Continued from page 14

sample may lead to improper cyanide sample preservation. As a result of this, an industrial user may be discharging cyanide to your facility above permit limits.

The information in this article is very general. As usual, check with 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 NEWEA Lab Practices Committee Chair Tim Loftus at (508) 949-3865 or timloftus@msn.com.

The Sludge Drying Bags used by Arnold Greenleaf at the Newport WWTF.