Sodium bicarbonate is added along with nitrifying bacteria to enhance the nitrification process. Fifteen percent (15%) of the flow is directed through these solar tanks for inoculation. The flow then combines with the remaining 85% entering the aerated wetlands lagoon. The lagoon is divided into three cells containing various forms of plant life. Willows are present in the first two cells. Parrot feather is used here as well and it was chosen for its low growth, yet extensive root system which creates a lot of surface area for bacterial attachment. A cold tolerant plant was brought from Florida and is used in the final cell. It was selected for its consistent performance despite low water temperatures. Snails are present throughout the process and they help to maintain a balance by consuming excess algae. Algae adds to the dissolved oxygen which averages a super-saturation of 15+ mg/L during warmer weather. The plants within the system supply the root systems that allow the microorganisms to attach themselves.

A microscreen follows the wetlands lagoon. It removes the solids, which are primarily algae, lost from the system. The microscreen automatically backwashes and this backwash is sent back to the solar tanks, helping to maintain the biomass.

One of the problems encountered during this pilot study is that the cooled waters from Jaffrey’s lagoons (during the colder weather) inhibited the nitrification process. The wastestream is currently passed through an on-demand water heater and nitrification has been re-established. The engineers are currently looking into heat exchangers and solar water heaters to see if these would be feasible for a full scale operation.

Another problem was an improperly sized microscreen. The original microscreen allowed solids to escape, causing high BOD and TSS values. A newer design has been installed that should eliminate this pass-through.

The wetlands treatment system has been very successful at treating septage in the New England area, producing an effluent that meets Class 1 drinking water standards for Massachusetts for most parameters. Its use in polishing treated wastestreams is still experimental. It offers new challenges such as cooler, and more dilute wastestreams (the system thrives under heavy loading). The pilot system has done very well at meeting the nitrogen limit despite cold weather start-up and operation and the TSS and BOD levels should remain within limits with the newer microscreen.

Cost studies done show that O&M costs for a wetlands system are comparable to conventional treatment when used to treat septage, but the capital costs are far less. As yet, no cost estimates have been determined for Jaffrey.

The pilot study will continue until May, so if you’re interested in viewing a truly unique concept, stop in to see Lew Gregory in Jaffrey.
NHPCWA OFFICERS

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Department of Environmental Services
6 Hazen Drive
Concord, NH 03302-0095
Att: Tom White

NHPCWA Directors Meeting
February 23, 1995


1) Minutes of last directors meeting were reviewed and accepted.

2) Ken reported on his and Keith’s meeting at the annual NEWEA meeting with the other regional association officers. The purpose was to increase and improve on interstate communication and interaction particularly in the areas of certification reciprocity and standardization. Training opportunities throughout New England, establishing internetting, NEWEA being an information clearinghouse, each state having a liaison for each NEWEA committee, more emphasis should be placed on collection system operations and making local officials more aware of the needs of wastewater operations and infrastructure public education and awareness.

Ken hopes that most of these current and pressing issues will receive increased attention in the near future and that this trend of interstate interaction will continue to evolve.

3) Trade Fair Dave gave an update on the trade fair. We’re still waiting form the Governors office as to whether he will be able to speak to us at the lunchion. Otherwise, Dave has a backup speaker who will be available. He updated the Directors as to current vendor sign up. He will be delegating sections of the phone list to directors for follow up calls. Dave, Ken and George will meet on March 20 to finalize floor plan and layout. We need volunteers to show up at 7:00 a.m. to help the vendors set up.

4) Association Committee Mike Butler discussed the status of developing written duties and changes of all assoc. committees. This way as directors change, new officers will have a document to return to as to their responsibilities and those of each committee that they are ex-official members of. Almost all committees have been written up.

5) Operations Challenge Ken discused the recent class that was held at the FTC to “demistify” and elaborate on the challenge competition. Unfortunately only one person showed up. We will be holding another training session at Franklin on April 14 at 9:00 a.m. The directors encourage as much participation as possible. A flyer will be written and mailed out to the members prior to this event.

6) Treasurers Report Rich reported that he, along with our accountant, met with our CPA to discuss the format of our new system and to get our tax return material in order. Everything seems to be coming together well. The new accounting system is up to snuff and will make tracking budget items a lot easier and will be more up to date.

7) Operators Certification Rules George Neill mentioned that certification rules must be readopted in the near future. He would like input from association members as to changes to be made to these rules. Announcement will be made to all intersted members at the trade fair. A meeting will be held in early April to kick off discussion on reauthorization.

8) Calendar of Events Keith went over the tentative calendar for the next years deadlines, meetings, publication and mailing dates etc.

9) Nomination of Officers The Nomination Committee submitted the following names to the board for the upcoming election: Mary Dowse, third Director; Doug Steel, second Director; Ed Rushbrook, Consultant Director; Ron Hoffman, Vendor Director; Doug Parker, Certification Committee; the remainder of those in presently held offices were also nominated.

10) Next directors meeting scheduled for April 20, 9:00 a.m. at Franklin.

Good-by President Ken

The Claremont WWTF staff are mourning the death of Brian Smith. Brian was an operator at the plant for 6 years.
Cleaning UV Bulbs

Harvey King

There are basically three ways to clean UV Bulbs (sleeves): 1) by hand, 2) in place, 3) in a tank. Our experience is that tank cleaning is best, but each method has its pros and cons. The following is our experience.

1) Hand Cleaning

For more than three years, we have cleaned our sleeves by hand. We fabricated several racks out of pipe to hang our UV racks at chest level. We sprayed on a cleaning solution with a plastic squirt bottle (need chemically resistant type), wiped the sleeves with a soft painting mitt, and rinsed them off with a hose and spray nozzle. We tried a number of different cleaners and talked to other plants that had tried more - one group even tried Easy Off Oven Cleaner! Limeaway was recommended in our O&M and we eventually settled on generic versions such as Ferrous Stain Remover (from the hardware store) and/or Passive-8 (from Agway). Both seem to work equally well but both contain phosphoric acid and require the use of rubber gloves, boots, apron, and goggles or face shield. One cleaner to stay away from is Muratic Acid because it will attack the stainless steel in the UV rack.

Pros? There is little equipment cost and it gets off sediment, and algae buildup. Cons: It is labor intensive, may result in sleeve breakage due to the amount of rack handling and electrical connectors burning out due to stray water. Most importantly, it is ineffective for mineral buildup.

Mineral buildup is primarily what pushed us to try alternate means of cleaning. In our case, the buildup is a white film. It appears only when the sleeves dry off - even though they have been hand cleaned and rinsed carefully. When the sleeves are wet, the film is invisible. Fisher and Porter, the manufacturer of our system, says that it is common to overlook that film because of the time it takes to let the sleeves dry.

2) Cleaning in Place

This is what you dream about! Don't have to pull anything out, nothing gets broken, etc. etc. One plant we know tried this using Citric Acid (from bagged granular form). It was easier and more effective than hand cleaning, but it did not remove the mineral film buildup. The other disadvantages were that we had to rig up a pump for circulation, a sluice gate to isolate the UV bank, mix the granules until they dissolved, and then start again for the next bank. That was a trouble enough. When we investigated also using a more aggressive acid to dissolve the mineral buildup on the sleeves, other problems loomed up such as how to protect the concrete channel and the pump, the cost of the chemicals, and how to reuse and/or dispose of the cleaning solution.

3) Tank Cleaning

Our first tank was made out of ½" plywood with several layers of hardware store polyethylene for a liner. It holds four racks and has several ½" PVC tubes drilled and submerged with a PVC header to allow us to agitate the water with compressed air - looks like a Jacuzzi when it's going. With a 50% mix of Agway's Passive-8 and water, the sleeves look like new after 10 to 15 minutes. It's a miracle! That is better than undiluted chemical used in hand cleaning. The contact time seems to make all the difference. One problem; it also took two people almost 2 days to clean our 736 bulbs - way too long. There is a cute stainless steel tank available on rollers but unless you only have a few racks, we'd recommend staying away from small tanks. The time to full racks, put them in, let them soak, drain them, and then reinstall them can eat up huge amounts of time.

We have since borrowed a gantry and hoist from another part of the plant and have fabricated a lifting rig to pull a whole bank at a time. A tank represents about $35,000 in bulbs, sleeves, etc. so we are... careful. We plan to buy a polypropylene tank big enough for the whole bank (approx. 4' x 6' and 2' high).

One added benefit of pulling a whole bank at a time is that the channel can now be scrubbed out easily. We have had sporadic high coliform counts and suspect that algae buildup and sloughing off from the channel sidewalls is the culprit.

Odds and Ends

A) Cleaning Solutions:

Experimenting in the lab can help you decide what cleaner will work best for your sleeves. We used pieces of old sleeves and put them in various cleaners and solution strengths for different lengths of time. We even used our Hach spectrophotometer to get a more objective measure of transmittance before and after cleaning. Currently we are using Agway's Prestige which has both Nitric and Phosphoric acid in it. However, it is fairly expensive - $70 for five gallons - so we will be experimenting with our own dilutions of Nitric and Phosphoric acid from chemical suppliers in the future.

Many cleaners have Citric, Phosphoric, and/or Nitric acid as their main ingredient. A brief overview of each is presented below:

- Citric Acid
  - Advantages: Low toxicity and no disposal problem for WWTPs.
  - Disadvantages: Frequent cleaning necessary, brushing required, ineffective for 'baked on' coating, encourages micro-organism growth (can't be reused or used in cleaning tanks).

- Phosphoric Acid (5% to 10%)
  - Advantages: Can be reused, suitable for cleaning tanks.
  - Disadvantages: Hazardous prior to dilution, some states may not allow disposal unless first neutralized with sodium bicarbonate (baking soda) or calcium carbonate.

- Nitric Acid (20% rec)
  - Advantages: Less labor intensive. Suitable for cleaning tanks, will not attack stainless steel, can be reused, no disposal problems for WWTPs.
  - Disadvantages: Hazardous prior to dilution, irritating fumes, o-ring seals need to be replaced more frequently (yearly).
One Town’s Approach to Dealing With Safety Issues

Art Boudreau, Chief Operator
Town of Winchester WWTF

This year the Town of Winchester made great strides towards promoting safe operating procedures around the plant. In addition to purchasing confined space entry equipment such as a gas detector and retrieval apparatus, the Town also dealt with the issue of how to safely clean the bar rack on weekends. The hand cleaned bar rack is located 3 floors down in the wetwell area. Normal procedure requires only 1 person to be on duty during the weekends. The lone person was always at risk whenever he went down to clean the rack alone.

A decision was made to upgrade the existing bar rack so that it would work automatically and altogether eliminate the need to enter the wetwell on weekends. The new system features another bar rack that is placed directly in front of the existing rack. This new rack is operated by compressed air. The rack itself is attached with pillow block floating bearings. Compressed air activates a cylinder which physically lifts the new rack up in a swinging motion similar to opening a door. The accumulated rags are then flung to the rear of the unit and collect onto a drainage pan. This system can also be operated manually from two different locations.

The total cost of the system was $3000 and was designed and installed by Scott Self. Scott is a self-employed proprietor of the Black Iron Forge Co. And has done much work for the Town at great savings. He is master electrician with significant experience in welding and mechanical work. The system has been on line since Nov. 23, 1994 without any problems. Scott has done another excellent job for the Town of Winchester.

Leo “Joe” Hebert Retires

Winifred Hebert

After 25+ years on the job, Leo “Joe” Hebert, Supt. of the Hooksett Village Water Precinct has recently retired.

Joe’s smiling face and his good humor will be missed by the town’s people. He was always ready to give a helping hand and a few good words of advice to anyone who would ask.

Joe was known for his ingenuity and good old Yankee know-how, which he has used many times to fix or rebuild things in order to save the town money.

Joe loves fishing and as his many friends can testify, he is quite a fisherman!

Another of his favorite places to go is to Robie’s Country Store, where he can usually be found having a good cup of coffee while reminiscing about the good old days.

A Trivial Question for Inquiring Minds

Q: What were the total gallons of wastewater processed by New Hampshire’s treatment plants during 1994?

Answer in this issue.

Laboratory People Please Take Note!

In the heart of the White Mountains of New Hampshire during the month of June the NEWEA Laboratory Practices Committee will be sponsoring a training opportunity worthy of your attendance. The course, entitled “The Care and Proper Feeding of Your Laboratory Equipment”, will be held at the Mount Washington Hotel during NEWEA’s Spring Conference on Monday June 5th 1995 at 10:00 a.m. Richard Schieferstein president of Q.C. Services, Inc., located in Harrison, Maine is to be the featured speaker. Mr. Schieferstein’s presentation allows attendees the opportunity to learn through actual demonstrations how to properly care for the following equipment:

- Balances and Scales
- Turbidimeters
- Autoclaves
- pH Meters
- Conductivity Meters
- Microscopes
- Spectrophotometers
- Thermometers
- Incubators/Bath
- Centrifuges

The course is an active and enjoyable presentation which would benefit operational/laboratory personnel working in water/wastewater analysis. For more information on the NEWEA Spring conference please contact Elizabeth Hafner, NEWEA Executive Director, at Tel. * (508) 658-0448. If you have specific questions regarding the above mentioned training please contact Nancy McAuley-Leslieur, Lab Practices Committee Chairperson, at Tel. * (603) 594-3365.
How Complete is Your Chain of Custody?

Jennifer Rowland, Laboratory Manager
The Sott Lawson Group, Ltd.

Imagine the nightmare in which you are on the witness stand testifying about your sampling protocol and the laboratory data is produced? It would be at this moment that you would instantly realize the importance of a strong Chain of Custody! The Chain of Custody is one of the most important aspects of a strong sampling protocol. A great deal can be learned about each sample from the information recorded on the Chain of Custody. This information includes the sampling date, the sample preservative, and who was in possession of the sample at any given time. If laboratory data should be involved in any legal proceedings, the Chain of Custody would be crucial to the validity of the sampling protocol and the laboratory data. It is imperative that the information be accurate and complete on the Chain of Custody.

The USEPA requires that specific information be documented when sampling. This required information would include the date, time and person performing the sampling. The exact local of the sampling must be spelled out, along with number and type of containers, volume of sample, preservative and how the sample was stored.

It is extremely important to include the exact laboratory analysis that the sample requires. Be very specific in this section so there will be as little room for error in interpretation when the sample arrives at the laboratory. The comments section on a laboratory submittal should be used for any specific communications to the laboratory. The field sampler or the laboratory sample custodian at the laboratory may use this section to record the actual conditions that your sample arrived at the laboratory in, i.e. pH, preservative, temperature, method of shipment and sample damage that might be evident.

It is much easier to spend a few moments at the time of sampling, to accurately and completely fill out the Chain of Custody then to have the tasks of recreating information months or years down the road. Don’t let your worse nightmare come true, make sure your sample protocol includes strong Chain of Custody documentation!

They’re Here!!

Biosolids are a natural resource! And what better way to proudly and conspicuously proclaim this message than by wearing it? This new biosolids T-shirt, available through NEIWPC's Residuals Workgroup, says it all (on the back) in a blaze of colors—red, green, gold, and black.

Be the first on your block to own one.

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Plant Safety Officer and General Grunt

Scott MacDonald, WRBP-DES, NH

Should you use outside contractors for your safety program? As I sit here pondering what to say about this subject, I've come to realize that for a lot of circumstances I guess I am for it. Now, before your Yankee "I'll-do-it myself" feelings get all bent, let me explain myself and expand on the reasons for my train of thought.

As you may already know, I'm the safety officer for the Winnipesaukee River Basin Program (part of the NH Dept of Environmental Services) that covers the Lakes Region of New Hampshire. It's a reasonable-sized plant that can handle 11.5 MGD and services 14-or-so towns in the area. Our area of geographical coverage is roughly a triangle-shaped hunk of the state whose points are formed by the Center Harbor area, the town of Gilford, and then down to Franklin to include most of everything in between. While it may not have the largest flow capacities in the world (or the state for that matter), it is spread out with lots of pump and metering stations in remote areas. It also has some pipelines that go through places that will make you understand the meaning of "Can't get tha' from heyal!" We currently employ about thirty people of various trades from secretaries to mechanics and operators to electricians. Now the reason that I'm going to tell all the trouble to explain this is that the one position that we don't hire for is plant safety officer. Every so often, we hold a democratic election to elect a safety committee. The safety committee then holds an election and the person who gets the short straw becomes the safety officer for a few years. This seems to work out pretty well so far, so we'll probably keep doing it this way. Since this person is now a safety officer in addition to his or her normal routine, the safety officer is in reality a part-time position. I personally get about two days a week to put on my "SAFETY MAN" hat and make the world a safe place to work in. Now don't get me wrong, I'm not griping about any thing, I'm just setting up the background for my position on this subject.

One of the first tasks I had as the shining new safety officer was to complete a manual dealing with confined space entry. What I got to start with was an outline and a lot of unrelated material and clippings that had to somehow be put into order to comprise a confined space manual. Also, at the time I was writing this, OSHA hadn't finalized anything and was still changing the rules almost as fast as I could do rewrites (or so it seemed). Well, I did it...at the cost of months of man-hours and a lot of bitten-off fingernails. When the manual was finished, the first thing I had to ask myself was, "What have I missed or overlooked?" Let's face facts: I'm not a lawyer who writes these things for a living, and with the way the court system is going nowadays, I don't want to lose my shirt and house due to a personal injury or wrongful death lawsuit.

What this all boils down to is you get to learn from our mistake. I spent months of time researching and writing a manual, and we still had to hire a consultant to look at it for content and legality. For a little bit more than what we paid for consultant's fees, we could have had them write a "semi-custom canned" confined space program for us. It would have saved us a lot of man-hours that could have been used elsewhere, and it would have been right the first time.

Now I'm not saying that "hired guns" are right to use in every situation. For some of the piddly material it may well be cheaper and faster to do it yourself, but for the larger stuff they can be a big help and save you money. You just have to sit down with them and explain what your needs are and what your budget can afford. This is especially true on big and complicated programs.

As an example of this type of cooperative contract, we are currently working on an OSHA mandated hearing protection program (Note: as a municipality, we are technically exempt from OSHA control, however, we are governed by the state labor safety laws which are basically rubber-stamped versions of the OSHA mandates. In addition, we are trying to become fully OSHA compliant to avoid the big rush should municipalities lose their exemption). Our budget (like everyone else's) is not unlimited, so we had to strike a deal with the consultant we decided to work with. The deal works like this: We do all the legwork and in-house data collection, they take the data and write us a custom hearing protection program. They supply us with data collection equipment (sound level meters, noise dosimeters, etc.), show us how to work it, and then we do all the required legwork with it under their supervision. For this program, it only took me about two days total to run tests on the entire plant and pump stations, and then another day to set-up and have everyone wear a noise dosimeter for a six-hour monitoring period. After that, I sent all the data to the contractor and we'll get back a finished hearing protection program tailored to our needs. All we have to do at that point is create a training schedule and implement it. Even though we're paying hard currency to the contractor for this, the cost and the turn-around time are still less than if we had to buy or rent the equipment ourselves and then spend weeks or manhours researching and writing a program that may still have a legal snafu hidden in it. We've decided to go this route with our haz-com program and others as time and/or budget allows.

Now, this works okay for a medium sized plant like ours, but what if you're a small, two or three person outfit? Chances are you're already busier than a one-armed lab assistant, so what do you do? Why reinvent the wheel?? I would check out some of the companies that are offering so-called "totally canned" safety programs. These are complete, bare minimum, no-frills safety programs that, if followed, should keep you legal in the eyes of OSHA (not to mention keeping you and your workers from finding out personally just what a mortician does for a living). While some of them are pretty generic in description, others go into great detail and actually offer some good product for a reasonable price if you don't have too many unusual situations at your plant. In the case of our confined space entry program, we're so spread out geographically that an 'off-the-shelf' canned program wouldn't do us much good. However, to a smaller plant or one with fewer usual circumstances, they can be just what the doctor ordered. As far as pricing goes, most of them that I've seen start in the $295.00 area and go up from there, depending on what options you want. If you want the full blown, whole hog deal with training videos and handouts expect to pay out at least $1000.00 or more before you're through. You may have to make very minor alterations to these programs to match them to your particular needs but it will probably be faster and save manhours (which translates into money, coffee, nerves and

Plant Safety—Continued on Page 7
Intent vs. Content: To hire a consultant or not?

Jim Knowlton: Director of Client Services
The Scott Lawson Group, Ltd.

Hiring or not hiring a consultant is typically not the most important question when beginning an Environmental, Health and Safety (EH&S) project. Rather, defining the intent and goals of the finished product and who the internal and external end users are should be your key concern.

With this information, you need to decide whether your staff has the ability, time, and manpower to complete this project, and to meet the goals and time frame previously developed. Many times when undertaking EH&S project, the organization’s goals are “completing the written program” or “conducting the training” while more emphasis should be placed on the intent of the program and the end user’s ability to easily use the program.

In most instances, Federal regulatory agencies are interested in seeing completed written programs, but more importantly, they need to be effective and performance oriented for the employees at risk. Although this seems like an obvious comment, many organizations never include the affected parties in discussions regarding how the rules or policies will affect their work. In the extreme case, program writers may not even be aware of all the risks they should be addressing within the program and can actually create new risks or program requirements without being aware of it.

Once an evaluation has been made as to the intent, goals, affected parties and time frames, organizations can make educated decisions regarding the use of a consultant. Factors which may require the use of a consultant include limited time schedules, limited internal knowledge of program requirements, staffing shortages or a particularly complicated task.

An experienced consultant’s strengths are in the ability to use past experiences from other types of facilities (i.e. industrial, power generation, or paper manufacturing) to help develop your program. Often program components which were effective in other types of facilities can be adopted to your facility in order to simplify your program. This can save you time, money and effort.

The most difficult part of hiring a consultant is separating fact from fiction. As there are very few formal requirements to be “a consultant”, people hiring consultants should be careful in who they choose. References, national accreditations and years of experience should be considered. Evaluating a consultant strictly on price or hourly rates can be a costly mistake. Experienced consultants can often complete a project in less time than an inexperienced firm while producing a quality program. When obtaining bids, a good practice can be to ask for a “fixed” or “not to exceed” price, and request references for similar type projects. This can help you evaluate price and past experience.

Another valuable use of consultants' services is that of an on-call resource. Consulting firms which are on retainer often will not charge for simple questions called in by their clients. This serves two purposes. First, both parties develop a relationship and knowledge of the other's needs; second, simple questions can be asked early on in a project before mistakes may be made which require correction. Building a relationship with an experienced consultant can be your most valuable tool.

Thank You

NEWEA Operations Challenge Sponsors

John R. Bush

The December 1994 Collector was chock full of items regarding Operations Challenge. There was poetry and pictures, articles by team members and ardent supporters, and recognition of team sponsors. In this edition, I would like to recognize a group that receives very little notice, but, without whom Operations Challenge would not happen. Every Association member should extend their appreciation for all the support given by these sponsors. Another way to thank these companies is to utilize their services when the opportunity arises.

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Thank you NEWEA Operations Challenge Sponsors From the New Hampshire Water Pollution Control Association.
Controlling Filamentous Organisms: The Use of Selectors in Activated Sludge

Wes Ripple, NHDES

Many activated sludge plants occasionally or even routinely develop populations of certain types of undesirable microorganisms within the mixed liquor. Their presence in sufficient numbers can adversely impact plant operations and effluent quality. They are known as filamentous organisms and are responsible for problems such as slow settling mixed liquor (otherwise known as sludge bulking) and foam production. Filaments are generally associated with certain plant operating conditions such as low F/M, low D.O., low pH, septicity, and nutrient deficiency. The preferred remedy is to alter the appropriate operating conditions in order to hinder their growth. This may be impossible in some cases or undesirable in others. Selectively killing them with the addition of chlorine to the return sludge is another alternative but may prove toxic to the more beneficial organisms if added in excessive amounts.

We know that filaments are excellent scavengers and can grow very well when subjected to low levels of food (BOD) and dissolved oxygen. Floc forming bacteria, on the other hand, grow better when exposed to higher amounts of food. When placed in a concentrated food environment under the proper conditions, filamentous growth can be minimized and the more important floc former growth maximized. It is with this understanding that yet another control method has been developed, and that is the concept of selectors.

A selector is a zone where the RAS and aeration tank influent mix under high F/M conditions. This can take place in a separate tank(s) prior to entering the main aeration basin or in a zone within the main aeration basin itself. For example, the head end of very long, very narrow plug flow reactors provides this type of environment. It is within this zone that the floc forming bacteria very rapidly take up and store the easily obtainable portion of the soluble BOD. Most filaments are at a disadvantage at this point because they can't take in food at such high rates and lack the storage capacity of the floc formers. In a selector environment, whoever can get to the food first and store it will predominate, and in theory this would be the floc forming bacteria. The storage products also allow the floc formers to survive for longer periods of time under starvation conditions in the main aeration tank. Starvation conditions are created because the floc formers have already removed most of the incoming food in the selector.

A source of energy is required before this food can be placed into cell storage. This energy is derived from the type of conditions present in the selector. If oxygen is used for energy, then the selector is aerobic. If no oxygen is present but NO₃⁻N is used, the selector would be considered anoxic and denitrification would take place. The denitrification reaction provides the energy source needed to store the food. If neither oxygen nor NO₃⁻N was present and phosphorus compounds were used as energy, then the selector would be anaerobic. These energy reactions also help to discourage filamentous growth. All filaments are strict aerobes. To survive in an anoxic environment, a filament must have the capability to denitrify. Some filaments can't denitrify at all or some only at a rate much slower than the floc formers. A few filaments can only partially denitrify, such as to NO₂⁻. Floc formers are excellent denitrifiers and this gives them the capability to get to the food first. Many filaments are also unable to use phosphorus compounds for energy, thus making their survival under anaerobic conditions difficult.

What are the proper conditions to make a selector operation successful? For aerobic selectors, the F/M ratio should be at least 4.0 to 6.0 lbs. BOD/lb MLVSS. This is 10 - 30 times higher than you might find in the main aeration basin. Anaerobic selectors also seem to work better when they are compartmentalized. This is because an F/M gradient can be established where the F/M is much higher in the first zone and gradually tapers off at the end of the last selector compartment. Compartmentalization also serves to prevent backmixing, which would tend to dilute the tank contents. The suggested minimum is 3 compartments. Compartmentalization is not so important for anoxic or anaerobic selectors due to the added pressures imposed on the filaments by denitrification and phosphorus uptake; however, their performance can be improved through the use of compartments. These added pressure also allow for the operation of anoxic and anaerobic zones using slightly lower F/M values.

High respiration rates of around 50-60 mg O₂/hr/g MLVSS are encountered in aerobic selectors. For this reason D.O. levels of at least 2 mg/l should be maintained throughout the selector in order to prevent the occurrence of low D.O. filaments. Anoxic selectors require that nitrification take place first within the main aeration basin. Every effort should be made to exclude D.O from the anoxic zone. The exclusion of D.O. and NO₃⁻N from anaerobic systems is also crucial to their success.

Selectors should be sized to remove at least 80% of the applied soluble BOD. The greater the pretreatment removal, the better they will perform. The absolute minimum should be no lower than 50%. Detention time is critical. If the selector is too small, large amounts of soluble BOD can leak into the main aeration basin producing low F/M filaments. If it is too large, the required high F/M concentration may not be reached due to excessive dilution. Generally speaking, detention times of around 15 minutes are adequate for aerobic selectors, 15-30 minutes for anoxic selectors, and .75 to 2.0 hours for anaerobic selectors.

RAS control is also important. The biomass concentration in the selector should be 3 to 4 times that of the MLVSS concentration in the main aeration basin. Returning all of the RAS to the selector has proven effective in plants treating primarily domestic wastes. This may not always work in industrial systems. Provide as much flexibility as possible for RAS distribution.

Selectors take time to work. Allow at least 6 MCRTs to develop the right mix of organisms. Unfortunately, selectors are not effective in controlling problems caused by septicity (although they do control sulfur oxidizing filaments such as Thiothrix.) Likewise for low pH and nutrient deficiencies. These problems must be corrected at the source. There are also several filament types that are not always controlled by selectors. They are types 0041, 0675, 0092, and M. parvicella (this regrettable, since M. parvicella is a very common filament).

Selectors—Continued on Page 9
Plant Profile: Dover WWTP

The Dover WWTP is a conventional activated sludge treatment plant situated on the banks of the Piscataqua River. While the city has a population of about 26,000, only about 12,000 are tied to the WWTP. The collection system has approximately 100 miles of lines part of which are separated and part combined.

The plant is relatively new and went on line June of 1991. It replaces a primary plant that the city had used for 30 years prior to the 1970's EPA regulations mandating an upgrade. Cost of the total upgrade was approximately $30 million. The plant itself cost $18.6 million, while the pump station at the old plant site, engineering, and the force main to reach the new plant took the remaining funds. This was done in the days when federal and state subsidies were available so that the cost to Dover itself for the whole upgrade was only about $1.7 million.

The plant is currently receiving an average of 2.2 MGD with effluent BOD and TSS averages of 12 mg/l and 7 mg/l respectively. Design flow is 4.7 MGD with a peak daily flow of 16.8 MGD. The plant staff noted the pump station has two 600 hp pumps (as well as two 250 hp pumps) and they recall that during several past hurricanes flow to the plant exceeded 20 MGD!

Wastewater Operation Certification

The rules under which the Certification committee operates, Env-WS 901, are up for readoption. The committee is looking for input from the “Regulated Community”, in other words YOU, the operator who is directly impacted by these regulations. For those who are interested in participating in the shaping of these rules, there will be a round table discussion at the Franklin Training Center on April 6, 1995 at 9:30 AM. Your opinion counts!

UV Bulbs—Continued from Page 3
Note!!!!!!!!!!

Of the typical strong acids available, only nitric acid is recommended. Hydrochloric (Muriatic) and sulfuric acids are not recommended. They may attack the stainless steel and rubber (o-ring) components of the lamp rack.

B) Tank Materials

The polypropylene tank we hope to buy will run about $800. Price estimates given us varied from as high as $3600 - so shop around. A steel braced plywood tank lined with fiberglass or other chemical resistant coating is also feasible and perhaps less expensive. One coating, CIM 1061 by Pro-Coat Systems is paintable, has excellent chemical resistance, and would cost about $300 for our tank size.

Physically, the plant is set up with two rectangular primaries, 4 fine bubble diffused aeration basins, and 2 circular secondary clarifiers. Disinfection is by UV with a total of 736 bulbs. Dewatering is done with two 2 meter gravity belt thickeners and two 2 meter belt filter presses. Solids are treated by extended static pile composting and sold to local contractors as a soil amendment. Individual Dover residents get the compost for free.

There are currently 9 staff members at the plant; a project manager, an assistant project manager (ops supervisor), three operators, two maintenance, one lab supervisor/pretreatment coordinator, and one lab/administrator assistant. All are certified: four Grade IV’s, four Grade II’s, and one Grade I.

An issue of some interest is the fact that the plant is run by a contract operations firm, Operations Management International. The city contracted operations out to OMNI early in 1992 and have extended the contract to the beginning of 1996. As it stands now, the city will have the plant go out for rebid again at that time. The city has expressed satisfaction with the plant’s operation but apparently wants to be assured that it is getting the best operational cost available.

Answer to Trivia Question

A: A total of 32,218,219,000 gallons of wastewater was treated by New Hampshire’s wastewater treatment plants during all of 1994. This equates to an average daily flow of 88 MGD. In comparison, the Boston Harbor project will be capable of treating average daily flows of 455 MGD.

Selectors—Continued from Page 8

The benefits of selectors go way beyond just controlling filamentous growth. Improved settling characteristics may actually increase a plants operating capacity. They serve as terrific buffer zones and can protect the main aeration basin from large organic swings. Improved nitrification can also occur due to less BOD entering the main aeration tank. Anoxic zones allow the opportunity for recovering alkalinity and oxygen depleted during nitrification. And finally, phosphorus removal is enhanced via the anaerobic process.

With a little ingenuity, it may be possible to retrofit selectors into existing structures; or, if your plant is scheduled for an upgrade or expansion, this would be the ideal time to build one into the system. Try bench scale testing first if a lot of money would be involved. This is definitely something to think about if your plant has been plagued with filamentous growth. In the mean time, HAPPY SETTLING!!!
** FTC SPRING 1995 COURSE ENROLLMENT FORM **

MAR 08  Toxicity Testing
MAR 15  Industrial Pretreatment
MAR 21  Basic Computer Spreadsheets  (Limit 18)
MAR 29  NEIETC - Dealing w/Extremely Hazardous Substances  Register directly w/NEIETC
APR 05  Blower Maintenance
APR 11  Teamwork (am) / Stress Management (pm)
APR 14  ** APPLICATION DEADLINE FOR JUNE 13 EXAMS **
APR 19  Land Application of Biosolids
APR 25-27  Collection Systems Lectures & NEWEA Exams
MAY 03  Instrumentation & Alarms
MAY 04  SEAL-PRO Fluid Handling Technology Seminar  Register directly w/SEAL-PRO
MAY 09  Advanced Activated Sludge
MAY 11  Certification Exam Review - All Grades
MAY 16  Advanced Computer Spreadsheets  (Limit 18)
MAY 18/19  Pesticide Application Training & Certification
MAY 23  NEIETC: Anaerobic Sludge Digestion  Register directly w/ NEIETC.
MAY 24  E-Coli Testing & Reporting
MAY 25  Basic Math Principles
MAY 31  Safety: "Risky Business" / "Beyond Safety"
JUN 01  Wastewater Math Review
JUN 13  ** CERTIFICATION EXAMS - ALL GRADES **
JUN 14  NEIETC: Hands-On Confined Space Entry  (Limit 20) Register directly w/NEIETC.
JUN 15  NEIETC: Hands-On Confined Space Entry  (Limit 20) Register directly w/NEIETC.

NOTE:  See course descriptions for cost of class.  No cash accepted.
Make checks payable to:  TREASURER - STATE OF NEW HAMPSHIRE
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George W. Burke Jr. Facility Safety Award Application

DESCRIPTION
The WEF George W. Burke, Jr. Facility Safety Award is presented through NEWEA to a selected municipal or industrial wastewater facility in recognition of a documented illustrated safety program and safety record. The award is presented to the selected facility at the annual NEWEA meeting.

PURPOSE
To encourage an active and effective safety program in wastewater facilities and to stimulate the collection and reporting of injury data.

SELECTION
The award applicants are evaluated and selected according to the following criteria. An on-site visit by the NEWEA Safety Committee may be included during the evaluation process.

CRITERIA
1. Personal Safety Awareness Program
2. Orientation Program
3. On-going Training Program
4. Inventory of Safety Equipment
5. Injury Occurrence Statistics
6. Personnel Check-off System of Skills
7. Program Which Extends Beyond the Plant
8. General Appearance & Content of Application
9. Member Affiliation with WEF
10. An Outstanding Feature
11. Written Safety Program
12. Safety Committee Minutes for previous year (1994)

APPLICATION PROCEDURE
Send application to:
NEWEA Safety Committee
c/o Vicki Abbey, Chair
P.O. Box 347
Sunapee, NH 03782

Applications must be received by April 15, 1995.