

CHESAPEAKE



Ecoletter

SUMMER 2007 ISSUE



WWOA



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*A Publication of the Water and Waste Operators
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President's Message



CWEA President

—Bharat Desai

Hi everyone! This is my last message as my term as the President of CWEA will end in a few days. The year passed by very quickly and it was fun to work with such a fine group of people. There are so many things to do

and so little time to do it.

It did not take a lot of effort on my part to provide leadership to the organization as my predecessors have set up and run a very fine professional organization. The people who have done real work for you are dedicated board members, committee chairs, and committee members. They did excellent work in planning CWEA events and executing them. They deserve recognition for their effort. I want to thank them for all their hard work.

Some of the initiatives started during my term will continue during the next year for completion. We hope to get approval at the Joint Conference for modification of Articles of Incorporation to change CWEA present Internal Revenue Service tax-exempt status from 501(c)(6) "trade association" to 501(c)(3) "educational organization" which is the most advantageous tax status. Updating Bylaws will follow this approval. We plan to publish and deliver the CWEA Members Directory shortly. We have initiated an inquiry for outsourcing the publication of Ecoletter. We have started working on Business Practices Manual to streamline CWEA activities and make it easy for new board members, committee chairs, and committee members to understand their roles and responsibilities, and also how to successfully plan and implement CWEA activities and events.

We have started E-Newsletter to deliver information on CWEA activities and events by e-mail in a timely manner for members benefit. If you are not getting E-Newsletter or CWEA program announcements by E-mail, contact Kim Dighe (CWEA Administrative Assistant) at kimdighe@verizon.net and provide your correct E-mail address along with mailing address, telephone and fax numbers, so she can get your record corrected or you can update your WEF member profile yourself by visiting https://www.ewef.org/timssnet/login/tnt_login.cfm?redirect=CUSUPDATE.

We plan to use the latest membership information available in the WEF database for all CWEA electronic

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WWOA President

—Bob Stenger

A Year in Review

Iwant to thank the members of WWOA for allowing me to serve the organization as President for the 2006–2007 year. I have enjoyed the opportunity to work with mem-

bers of this organization and with those of our sister organization, CWEA and will cherish the friendships developed on both a professional and personal level.

I'll take this opportunity through the "President's Message" to communicate some of the highlights of the accomplishments of this year's WWOA Main Board.

The Board entered into a contract for administrative services with Kimberly Dighe to assist with administrative tasks including the maintenance and administration of the membership records for the organization. The board believes this will be a positive step forward to avoid some of the difficulties encountered in the past with regard to the accuracy of the membership records. I acknowledge that some problems occurred with mailing membership cards this year but expect that it was a result of the end of the year transfer of the records from the previous company to the new one. The Board expects membership issues will flow smoothly from this year forward.

The Board helped to negotiate the transfer of the CWEA/WWOA website from the original webmaster, Karl Ott, who took the initiative to start the web site, to Anthony Rocco who is doing a tremendous job on a volunteer basis to keep the website current. If you have not visited the website lately please do so at: <http://www.wwoa-cwea.org>.

On behalf of the WWOA board, I signed Memorandum of Understanding agreement to extend the excellent working relationship established by previous boards, to hold the annual conferences and to spell out an equitable distribution of any net proceeds from the conference.

Speaking of the conference, please give big thanks of appreciation to the members of WWOA and CWEA who volunteer their time and effort to make the annual conference happen each year. If you ever have an opportunity (yes you can volunteer!) to be involved firsthand with

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Calendar of Events
Fall/Winter

S M T W T F S

November 2, 2007						
Collection System Committee Private Property Inflow & Infiltration Seminar Linthicum, MD						
January 7, 2008						
Deadline for Call for Papers abstracts for the 2008 Tri-conference						

Change of Address

Please forward your change of address and membership number to the appropriate organization:

<p>WWOA Secretary Janet Owens DCWASA 202-787-4197 Janet_Owens@dcwasa.com</p>	<p>CWEA Secretary Ray Schulte KCI 410-316-7800 rschulte@kci.com</p>
---	--

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TO ALL MEMBERS:

When completing membership renewals, make sure all information is correct and current. We use WMBA (WEF Membership By Access) for membership information. If there is an e-mail address, please include it.

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Editor's Corner

We all know that turning the health of the Bay around is frustratingly complicated. One of the complications is the role of agriculture. All of us have to eat and agriculture feeds us—and our gas tanks.

More and more farms are growing corn to make ethanol. A drive across the Midwest this summer showed few fields of grain and soybeans and seemingly endless rows of corn. All told, 93 million acres of corn were planted in the US this year and because of the demand for ethanol it is estimated that up to one million additional acres of corn will be planted in the Bay watershed in the next five years. With approximately nine million acres of agriculture land in the Bay watershed, this gives you an idea of how dominant corn production could become. Since corn requires more fertilizer and energy to grow than many other crops, an additional 8–16 million pounds of nutrients could enter the Bay. This is one of the reasons there is a growing chorus that corn-based ethanol is not the answer to our energy needs and a reason that hits home with us water professionals working to improve Bay waters.

Every five years the huge federal farm bill is renewed and 2007 is the year for the latest revision. This year's proposed bill calls for \$286 billion over the next five years and reflects a growing realization that the impact of agriculture activities need to be addressed by setting aside 8–9 % of the total funds for environmental issues. For us folks in the Bay area, \$212 million is included in the proposed bill for water conservation in the watershed. That's not much in the big scheme of things, but it is better than nothing and more importantly a big increase over past farm bills. Keep your eyes on the progress of this bill for it will have an impact on Bay water quality.

The August 2007 issue of U.S. Water News had a good editorial on why bottled water is bad. Some quick facts will give you the picture;

The FDA regulates only 30–40 % of bottled water sold across state lines.

EPA requires up to several hundred tests per month on tap water, but only requires one test per week on bottled water.

Nearly 40% of bottled water is filtered or treated tap water.

U.S. plastic bottle production requires more than 1.5 million barrels of oil a year.

Americans go through 2.5 million plastic bottles every hour.

86% of plastic bottles in the U.S. ends up as garbage instead of being recycled.

A gallon of tap water costs less than a penny while bottled water costs range from \$0.89 to \$8.26 a gallon.

Bottled water volume increased 9.5% in 2006 and now has sales exceeding \$10.8 billion in the U.S.

Further reading of the August issue brought the reason for the editorial. Anheuser-Busch has jumped into the bottled water industry with Icelandic Glacial spring water. The idea of melting, transporting, bottling and selling this water to U.S. customers has to be called absurd. As water professionals the only bottled water we use should be tap water put into reusable containers. And if you see anyone drinking Icelandic Glacial spring water unleash a tongue lashing on them they'll never forget. Better yet, let's start a boycott.

For any lover of rivers, Rivers of North America is a must have. This 1100 page book, edited by Arthur C. Benke and Colbert Cushing, and written by a host of technical contributors, is a pleasing reference for any academic type or river nut. It contains facts on animals, plants, ecology, hydrology, geology, geography, management, conservation and human history of each river and allows you to make comparisons between rivers on all sorts of things like flow, weather, land use, fish and non-native species. A particular treat is the pictures and drainage basin maps. They illustrate the diversity, beauty and special qualities of our rivers. The book does a good job of marrying a large comprehensive reach of information with enough detail to draw you in for a deeper look.

Another interesting book is When the Rivers Run Dry by Fred Pearce. This book covers rivers worldwide and presents very disturbing information on how water is used and misused. Major rivers such as The Nile, Yellow, and Indus and in the U.S., the Colorado, Rio Grande and Arkansas dry up miles inland. Large inland lakes like the Aral Sea and Lake Chad are disappearing and could cease to exist in the future. All this because of massive diversions of water for growing thirsty crops like cotton and alfalfa and huge population increases in desert climates. Groundwater levels in many places including the Great Plains of the U.S. have dropped hundreds of feet and will probably never be recharged. In people's haste to quench their thirst, millions have become poisoned by groundwater laced with toxic concentrations of Fluoride and Arsenic. Flooding on the Yellow River alone has killed hundreds of thousands and could one day kill millions. And you will learn about virtual water and how it affects water-

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Wastewater Treatment Technologies

—By Cynthia Lane, Co-Editor

The Chesapeake Bay has experienced a decline in water quality due over enrichment of nutrients such as phosphorus and nitrogen. In 1983, Maryland, Virginia, Pennsylvania and the District of Columbia entered into an agreement that identified a goal of a 40% reduction in the amount of nutrients discharged into the Bay by the year 2000. As a result of this regulation, the Maryland Department of the Environment (MDE) developed a program to address the achievement of this goal by upgrading the biological treatment processes of the major wastewater treatment plants to remove nitrogen and phosphorous to a specified level. The recommended treatment process used to achieve the required removal rates is a biological nutrient removal process that can achieve effluent concentrations of less than 8 mg/l total nitrogen (TN) and 3 mg/L total phosphorous (TP). In 2000, the participating states recognized that a larger effort was needed and they entered into the Chesapeake Bay 2000 Agreement. This agreement requires further reduction in the amount of nutrients entering the Bay of about 20 million pounds of nitrogen and 1 million pounds of phosphorous per year. To accomplish this removal effort, MDE is requiring that all of the major wastewater treatment plants (capacity of greater than 500,000 gpd) in Maryland be upgraded to include enhanced nutrient removal (ENR) technologies. The ENR treatment process is capable of reducing the total nitrogen and phosphorus concentrations in the wastewater to 3 mg/l TN and 0.3 mg/l TP.

When the Clean Water Act became a law in 1972, it provided states a tool for implementing water quality standards through the creation of Total Maximum Daily Loads (TMDLs) for impaired water bodies. A TMDL establishes the maximum amount of an impairing substance or stressor that a water body can assimilate while still meeting water quality standards. It is based on a comparison of the pollution sources and the in-stream water quality conditions and the resulting load is allocated between all of the pollution contributors. Since 1999, MDE has been developing TMDLs for the 134 water bodies located within Maryland that have been classified as impaired. TMDLs are required for certain water bodies when pollution control requirements are not stringent enough to meet applicable water quality standards. Various combinations of water bodies and pollutants result in over 655 potential TMDLs in Maryland. The implementation of TMDLs in a stream that receives treated effluent from a wastewater treatment plant can

have a significant effect on the plant's discharge permit. Traditionally, discharge permits are issued with limits identified on a maximum concentration basis, such as milligrams of a compound per liter. These limits allow for a plant to be in compliance with their permit if the plant sees an increase in flow, as long as the effluent concentration of the pollutants remains below the concentration as stated in the discharge permit. The issue associated with the implementation of a TMDL is that the permitted discharge limits are revised to be based on the maximum discharge of a certain number of pounds of a compound. This means that when flows increase at a wastewater treatment plant, the removal rates of the plant processes must also increase as more pounds of the TMDL compound must be removed for the plant to be in compliance with its discharge permit.

To comply with these two regulations, utilities are upgrading their wastewater treatment plants with processes that can achieve the ENR and TMDL program limits. Several different biological treatment technologies are being utilized to achieve the required effluent limits for nitrogen and phosphorous including:

5-Stage Bardenpho Biological Reactor

Membrane Bioreactors

Oxidation Ditches

A 5-stage Bardenpho process can be capable of reliably achieving the TN limits required by the ENR and TMDL programs. The 5-Stage Bardenpho process consists of anaerobic, pre-anoxic and aerobic zones followed by post-anoxic and re-aeration zones. The process, with an adequate carbon supply, is typically able to achieve an effluent total nitrogen concentration of 3–4 mg/L. Phosphorus release occurs in the anaerobic zone and phosphorus uptake occurs in the aerobic zones. The pre-anoxic zone provides an environment for denitrification followed by the aerobic zone for nitrification. Nitrate recycle pumps are provided to return nitrified wastewater from the end of the aerobic zone to the head of the pre-anoxic zone. Dissolved oxygen present in the nitrate recycle can reduce the denitrification rate; therefore, two anoxic sub-zones are provided to minimize the effect of dissolved oxygen and maximize the denitrification rate in the second sub-zone. Influent wastewater provides the carbon necessary for denitrification in the pre-anoxic zone; however, an external carbon source, such as methanol, added to the post-anoxic zone may be required for process optimization. Following the post-anoxic zone, a re-aeration zone is pro-

Continued on page 8

vided to oxidize any remaining carbon and strip any carbon dioxide or nitrogen gas from the mixed liquor before it enters the final clarifiers. Ferric chloride addition may be required to achieve the TP requirement in addition to downstream effluent filters.

Membrane bioreactor (MBR) systems can achieve a high level of performance and have proven to be reliable and increasingly cost-effective. There are various types of MBR's including submerged hollow fiber, submerged membrane plate, and in-series membranes. The membranes are used to separate the treated effluent from the mixed liquor of the activated sludge treatment system. The system operates at relatively high mixed liquor concentrations and thus can achieve long solid retention times in relatively small tank volumes. The membranes, which replace the clarifiers in a conventional activated sludge process, provide a positive barrier to effluent solids and, to a large extent, to bacteria and viruses. The MBR is used in association with biological process reactors configured in a 4- or 5-Stage Bardenpho process to achieve ENR effluent goals. Supplemental carbon and metal coagulant addition will be required to achieve the effluent TN and TP goals, respectively.

Oxidation ditches, also known as continuous loop reactors, are also capable of achieving 3 mg/L TN with the addition of supplemental carbon for denitrification. An oxidation ditch consists of several concentric circular channels/reactors and, under normal flow conditions, flow enters the outer loop and flows sequentially through the inner loops before leaving the reactor for final clarification. During high flow conditions, some or all of the influent flow can be routed into the inner loops. This way the outer loop can be used to store concentrated return sludge, maintaining biosolids in the system and reducing clarifier solids loading rates despite high influent flows. To achieve current ENR goals, downstream effluent filters are required for supplemental TP removal.

Any of these processes, when properly designed and operated, can produce effluent with a TN of 3.0 mg/L or less. In combination with chemical addition and effluent filters or other solids removal process, an effluent TP concentration of 0.3 mg/L or less can be reliably produced. Upgrading their treatment plants to one of these biological processes is an effective way for utilities to comply with the ENR and TMDL programs.

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Developing a Master Asset Protection Plan— A Road-MAPP for Success

—By John W. Fortin

Adopting a long-term asset management philosophy can help to create a more organized, effective team leading to significant financial benefits. For the past seven years, my efforts have focused on identifying and implementing best asset management practices. Currently, and as a former utility manager, I am involved in local/national/international research and collaboration with several public and private industries. As a result, I have collected and tested tools and techniques in order to define the total enterprise asset management model called the “Master Asset Protection Plan” or a road-MAPP for success. One interesting facet: whether we manage physical assets in academia, healthcare, manufacturing, R&D, and utilities, we are 90% the same and only 10% different. The difference is the product delivered, some unique asset types, and the customers we serve. A successful MAPP demands, involvement from key business units: planning, finance, engineering, construction, operations and maintenance. Employing Change Management principles will ensure your organization adopts and integrates asset management best practices and reaps the associated long-term benefits.

Core MAPP principles follow:

Asset Register—A master register/inventory of building and infrastructure assets maintained in the asset portfolio. Each asset receives a criticality value and a unique identifier to use with supporting programs/technology.

Condition Assessment/Monitoring—A program that collects and monitors the condition and/or performance of assets. Because data collection is expensive, a criticality/risk process determines depth and frequency so that critical assets are monitored more frequently.

Design and Construction Standards—A new projects program includes O&M Readiness practices such as nomenclature coordination, maintainability reviews, maintenance plan development, CMMS, GIS, and related practices.

Maintenance—A mix of maintenance policies (determined through a criticality review) monitor and maintain asset health. Policies must include preventive (PM) and predictive (PdM) practices managed through a Computerized Maintenance Management System (CMMS) and performance metrics.

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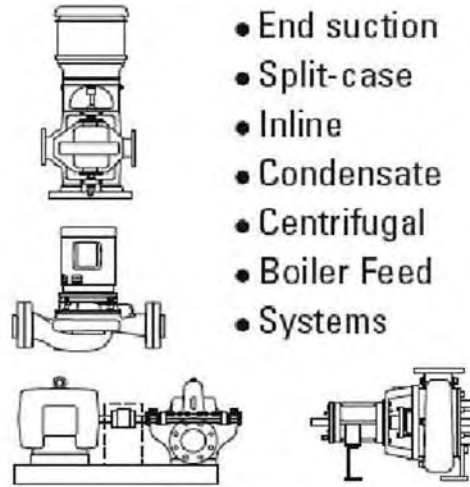
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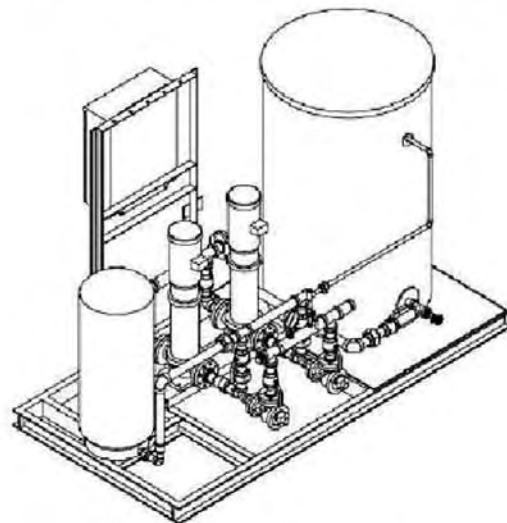
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Young Professionals Continue to Bridge the Gap with the Students Activities Committee

In conjunction with a student career fair sponsored by the Student Activities Committees of the Chesapeake Water Environment Association (CWEA) and the Chesapeake Section of AWWA (CSAWWA), the Young Professionals Committees of the Virginia Water Environment (VWEA), CWEA and CSAWWA sponsored a plant tour, speaker presentation, and reception immediately following the career fair at the DC WASA Advanced Wastewater Treatment Plant.

This is the second consecutive year that the Young Professional and Student Activities Committees joined forces for this annual event with goal of establishing a bridge between students and young professionals.



Students and YP's on enjoy a bus tour of the Blue Plains Advanced WWTP

Over 60 students, young professionals and those young at heart attended and enjoyed the event.

The bus tour provided an overview of the largest advanced wastewater treatment plant in the world. The Blue Plains Wastewater Treatment Plant

has a capacity of 370 mgd, a peak capacity of 1.076 billion gallons per day and covers 150 acres. The presentation, provided by Scott Weikert from CH2MHill, focused on DC WASA's Egg Shaped Digester design.

The YP Committees would like to thank DC WASA for allowing us to host this event at their facility and providing an excellent bus tour. We would also like to acknowledge Brock Emerson and Nina Andgren for their efforts in planning and executing the event.

If you would like more information about the various Young Professionals Committees, please contact Nicolle Boulay at nboulay@ch2m.com for VWEA, Priscilla Brown at BrownPR@bv.com for CWEA, and/or Sarah Ridgway at Sridgway@eaest.com for CSAWWA.



Our DC WASA tour guide explains the magic of settling

Editor's Corner

Continued from page 5

sheds. All this and more can be found in this well written report that strongly suggests that water and not oil will be the bigger issue in the 21st century.

Back in the late 60's and early 70's, college students protested against the Vietnam War. A similar protest occurred at a large university in the Bay watershed last year. Penn State students occupied the University President's office demanding the university reduce greenhouse emissions. The university decided to take action by pledging to cut emissions by 17.5% over the next five years and will buy 20% of its electricity from renewable

sources. Also an already active campus recycling program will continue to seek expansion of recyclable quantities and stress to students the importance of recycling in daily life.

Here at the *Ecoletter* we have a new co-editor in Cynthia Lane. Bob Wimmer, who she'll replace, will remain on the staff as an advertising manager. She comes well prepared for this new assignment with years of experience on our staff. As always you are encouraged to let us know how we're doing by sending an email or calling our two co-editors. We welcome the feedback and most of all we thank you for reading.

Consent Decree at the Spring Meeting

How You do What You Have to do

—By Paul Sayan, Spring Committee Chair

Close to 90 attendees were present at this year's Spring Meeting, held at the Patuxent Research Refuge National Wildlife Visitor Center in Laurel, Maryland, which focused on Consent Decree project management. How and why did the Spring Meeting Committee choose such a topic? Answer: how many wastewater professionals do you know are involved in some aspect of a Consent Decree? How many lives does a Consent Decree affect? Answer: the municipality's rate payers can probably answer that. This year's meeting featured five presentations that focused on three municipalities, Baltimore City, WSSC and DC WASA, currently under a Consent Decree and their project management approach to comply with their respective Consent Decree requirements.

Gary Wyatt, with the Baltimore City Department of Public Works, began the day by briefly discussing how the City's Consent Decree was developed and the department's project management approach. Gary and Carlos Espinosa (KCI Technologies) then spoke about the City's Project 1015 program management contract. Carlos discussed the Project 1015 team's responsibilities, which consists of providing technical assistance to the City and briefly described the team's current tasks, which includes developing sewershed study standards and providing technical coordination and assistance for the eight sewershed studies. As a pop quiz, Carlos asked the audience if anyone could explain the pattern shown in his hydrograph. The answer—a three-game set between the Orioles and New York Yankees (the author does not recall the correlation between peak flow and the seventh inning stretch).

Mike Marsjanik (EA Engineering) presented on behalf of Baltimore City's Project 1014 team, which is tasked with providing overall Consent Decree project management. The Project 1014 team ensures that all construction projects and sewershed studies meet their Consent Decree-mandated schedule. To avoid schedule delays, the team has developed various progress-tracking systems to track everything from construction and/or sewershed study progress status to e-mail correspondence so that the City can easily identify, forecast and avoid schedule delays and, just as important, to efficiently organize the information and documentation that are collected from the various projects. However, as Mike explained, the team's responsibility extends beyond short-term schedule forecasting. Based on information from the sewershed studies, the Project 1014 team is identifying rehabilitation projects that can be immediately executed to spread the City's costs over the next several years.

Scott Harris' (Baltimore City DPW) presentation focused on the City's geographical information system (GIS) updates, which are required under the Consent Decree and will be completed as part of each sewershed study. Scott briefly explained how data is transmitted to the City and the QA/QC process that is completed before the data is accepted by the City. Scott then showed a brief glance of the planned GIS interface and how the GIS users will have access to mapping, document retrieval and inspection records.

Calvin Farr (WSSC) presented on WSSC's approach to Consent Decree project management, which is tasked to the Commission's Wastewater Collection System Group. The group, consisting of 70 dedicated staff, manages and submits Consent Decree deliverables, maintain project schedules and manages the Preventive Maintenance Program. Over the next eight years, the Group will manage nine sanitary sewer evaluations. Calvin also provided details of other Consent Decree-mandated programs which are managed by the Systems Group including the Fat's, Oils and Grease database, flow monitoring, collection system hydraulic modeling and the Sewer Basin Repair, Replacement and Rehabilitation Plans.

The last presentation of the day, by Mohsin Siddique (DC WASA), described DC WASA's Consent Decree project management approach. Mohsin explained that the Authority has entered into three Consent Decrees—one requiring upgrades to the Blue Plains Treatment Plant, the Nine Minimum Controls, which immediately address combined sewer overflows and the Long Term Control plan, which will reduce future overflows. To date, the Authority has fulfilled all provisions of the first two Consent Decrees and, following the same project management approach, the Authority is confident that the mandates included in the Long Term Control Plan can and will be met.



Presenters (from left to right) Mohsin Siddique (DC WASA), Calvin Farr (WSSC), Gary Wyatt (Baltimore City DPW), Mike Marsjanik (EA Engineering), Scott Harris (Baltimore City DPW), and Carlos Espinosa (KCI Technologies)

Following the presentations, attendees and staff from the Wildlife Refuge enjoyed a bountiful lunch and four lucky contestants won the treasured door prizes. Congratulations to:

Hank Hulse, ADS Environmental Services
Winner of the iPod Nano
(courtesy of EA Engineering)

Rob Linthicum, RK&K Engineers
Winner of two CWEA Ed Norton Golf Tickets
(courtesy of CWEA)

Matthew Gurkin, Hartco
Winner of \$100 Gift Card to McCormick & Schmick's Seafood Restaurant (courtesy of Black & Veatch)

Kenneth Dixon, WSSC
Winner of \$100 Gift Card to Cheesecake Factory (courtesy of Whitman, Requardt and Assoc.).

The Spring Meeting Committee thanks each of the presenters for their time and effort and the sponsors for their generosity. The Committee also thanks each attendee and hopes to see everyone again next year!

Delaware Operator of the Year Luncheon Honors Several Outstanding Water Treatment Professionals

—By JuneRose J. Futcher

The annual Operator of the Year luncheon held last May at Delaware Tech was a valuable celebration of industry professionals. Delaware Tech's Environmental Training Center Department Chair, Jerry Williams, ran the event in a truly festive style. While the event was designed for specific industrial operators contributions, Williams made numerous introductions, making sure to not overlook the many and varied levels of business, educational, and government professionals; all having a hand in the efficient management and promotion of Delaware's water supply and drinking water quality.

The operator of the year ceremony was designed to recognize both water and waste water operators from a field of statewide facilities. Municipal and treatment facility management personnel submitted the nominations. These letters, replete with immense praise and descriptions of contributions, were presented to Delaware Tech Environmental Training Center for consideration.

There was no shortage of nominations. More than 18 operators were enthusiastically nominated, and with good reason. These men and women have made their life's work in a field where under-appreciation is common. This event regards the significance of these operators' work in the state of Delaware, regardless of a growing suburban populous or stable rural areas; where water use is either flowing over the top or running level.

The business of managing drinking water supply and treatment for wastewater is a critical service to the residential, commercial, and industrial consumer. The industry is burdened with designing, managing, and providing water required to meet extremely strict safety standards at state and federal levels. In many cases state water purity/safety standards are higher than federal criteria; many of which are federally mandated.

The two water and wastewater operator's were rightfully honored in a room of more than one-hundred and fifty guests. In reviewing the letters, the decisions were tough ones for the "Operator Of The Year" committee. Both gentlemen were selected from a pool of men

and women across the state.

Marlene Elliot, USDA Delaware/Maryland Director for Rural Development presented the awards to the honorees in the Delaware water business. Elliot exclaimed the water we have is a gift. Adding further comments about the industry, Elliot said, "thanks for the work you do."

Wastewater Operator of the Year

Jeff Deats of the Seaford Wastewater Treatment plant took the "wastewater" honors for his 15 years of work as a wastewater operator. In a matter of a few years he was named the superintendent of the facility; shortly after he attained "level four" operator credentials. No sooner did he become the leader of a facility in a busy industrial Delaware town, according to the City of Seaford, Deats was faced with a massive capital improvement expansion project. Deats took the project on; valued at 8.3 million dollars and brought the facility up to operating standards with new aeration systems. Not without surprise, Deats discovered an inefficient aeration/energy usage ratio- and with such discovery, the correction yielded a 25% reduction in operating costs for the City of Seaford. Deats, was clearly delighted to be praised and honored among a roomful of professional colleagues and peers. The award was well deserved and hard earned. Of the five nominations, Deats was selected in great consideration among his colleagues who possess strong and talented work philosophies in the water/wastewater industry. Deats added, "I love my job and I am a student of life and work."

Water Operator of the Year

The Water Operator of the Year honors went to **Steven Baker** of Artesian Resources. For up to 30 years, Baker has been a mainstay in the business of managing water flow and quality in more than 30 treatment plants and 100 well sites. And in the extreme residential and corresponding commercial development growing with

Continued on page 28

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EPA Approves New Test Procedures for the Analysis of Microbiological Pollutants in Wastewater and Sludge

—Robbin Crane, Cary B. Jackson, Ph.D., Roger Sedlacek, and Derek Walker, Hach Company, Loveland, Colorado, USA

SUMMARY OF FINAL RULE

The U.S. Environmental Protection Agency (EPA) is amending the “Guidelines Establishing Test Procedures for the Analysis of Pollutants” under 304(h) of the Clean Water Act (CWA), by adding new analytical test procedures for enumeration of *Esherichia coli* (*E. coli*) and enterococci in wastewater, and fecal coliforms and Salmonella in sewage sludge. The addition of these new methods may require entities with National Pollution Discharge Elimination System (NPDES) permits to begin monitoring for *E. coli* and enterococci in wastewater and fecal coliforms and *Salmonella* in sewage sludge within 30 days of the final rule being published in the *Federal Register* (FR).

BACKGROUND

In August 2005 and April 2006, EPA proposed for public comment (70 FR 48256 and 71 FR 18329) to amend the regulations at 40 CFR Part 136 to approve four *E. coli* methods and two enterococci methods for monitoring microbiological pollutants in wastewater, and two fecal coliform and one Salmonella method for monitoring of microbiological pollutants in sludge. On September 29, 2006, EPA pre-published the Final Rule of these new wastewater methods. Promulgation and publication in the Federal Register is expected in 2007.

METHODS FOR *E. coli* MONITORING IN WASTEWATER

The *E. coli* tests in wastewater include two membrane filtration (MF) and two multiple tube fermentation (MTF) methods. The MF methods include modified m-TEC, developed by EPA and m-ColiBlue24[®], developed by Hach Company. The MTF tests (Standard Method 9223B and AOAC 991.15) are Voluntary Consensus Standards (VCS) methods. Voluntary Consensus Standards are those developed or adopted by national and international VCS bodies. Both MF and MTF prepared media are available as commercial products.

Modified m-TEC is a single-step MF procedure that incorporates a chromogen specific to the detection and enumeration of *E. coli*. In this method, a water sample is filtered through a 0.45 μ m membrane filter, the filter

placed on modified m-TEC agar, incubated at 35 \pm 0.5 oC for 2 hours, and then incubated for 23 \pm 1 hour in a 44.5 \pm 0.2 water bath. Immediately following incubation, all red or magenta colonies are counted as *E. coli*.

m-ColiBlue24 is a single-step MF procedure that incorporates specific non-coliform growth inhibitors and a selective enzymatic indicator to allow for simultaneous detection and quantitation of both *E. coli* and total coliforms. A water sample is filtered through a 0.45 μ m membrane filter, then placed in a Petri dish containing a filter pad and m-ColiBlue24 nutrient broth and incubated at 35oC \pm 0.5oC for 24 hours. Blue colonies are enumerated as *E. coli* and red colonies are enumerated as total coliforms.

The MTF procedures contain the chromogenic substrate OPNG, which simultaneously detects *E. coli* and total coliforms. Water samples are added to commercially prepared tubes or packets of media. The sample is then mixed and poured into a tray or well, which is subsequently incubated at 35 \pm 0.5 oC for 24 hours. If detection is questionable after the specified incubation period, the sample is further incubated for up to an additional 4 hours at 35 \pm 0.5 oC. After incubation, each tube or well is compared to a reference color provided with the media. If the sample has a yellow color greater or equal to the reference color, the presence of total coliforms is verified. The sample is then checked for the presence of fluorescence. Fluorescence greater than or equal to the reference sample is a positive test for *E. coli*. The concentration in MPN/100 mL is calculated from the number of positive tubes or wells using MPN tables provided by the media’s manufacturer.

METHODS FOR ENTEROCOCCI FOR WASTEWATER

Tests for the detection and enumeration of enterococci in wastewater include one MF and one MTF method. The MF agar method mEI, developed by EPA, contains a chromogen specific to the detection of enterococci. In this method, a water sample is filtered, and the filter then placed on mEI agar and incubated at 41 \pm 0.5 oC for 24 hours. Following incubation, all colonies with a blue halo, regardless of colony color that are greater than 0.5 mm in diameter are counted as enterococci. The MTF method, a VCS developed standard developed by ASTM International, uses MUG media. Samples are incubated for 24 hours at 41 \pm 0.5 oC. After incubation, the presence of blue/white fluorescence is a positive result for enterococci. The concentration in MPN/100 mL is calcu-

lated from the number of positive tubes or wells as in the MTF tests for *E. coli*. Both MF and MTF prepared media are available as commercial products.

METHODS FOR FECAL COLIFORM IN SEWAGE SLUDGE

Tests for the detection and enumeration of fecal coliforms in sewage sludge include two MTF methods (LT-EC Media and A-1 Media) developed by EPA. The test using LT-EC media is a two-step procedure. The first step, tubes containing LTB broth are inoculated with sewage sludge and incubated for 24 ± 2 hours at 35 ± 0.5 oC. After incubation, the presence of turbidity and gas constitutes a positive presumptive test for coliforms. The absence of turbidity and gas requires a second incubation for 24 ± 2 hours at 35 ± 0.5 oC. Failure to produce turbidity and gas within 48 hours \pm 3 hours indicates fecal coliforms are not present. The fecal coliform test using A-1 media requires inoculation of tubes with sample and incubating for 3 hours at 35 ± 0.5 oC, then incubating at 21 ± 2 hours. Production of turbidity and gas within 24 ± 4 hours constitutes the presence of fecal coliforms.

METHOD FOR SALMONELLA IN SEWAGE SLUDGE

The test for *Salmonella* in sewage sludge is as multi-step MTF procedure developed by EPA. In the selective phase, tubes containing TSB are inoculated with sample and incubated for 24 ± 2 hours at 36 ± 1.5 oC. After incubation, drops from each TSB tube are spotted onto selective Rappaport-Vassiliadis agar medium semisolid modification (MSRV). The drops are allowed to absorb

into the agar for 1 hour at room temperature, then incubated at 42 ± 0.5 oC for 16 to 18 hours. After incubation, "whitish halo" growths from each sample are streaked onto two XLD media plates and incubated for 18 to 24 hours at 36 ± 1.5 oC. After incubation, one of the plates is submitted for biochemical confirmation. The other plate is refrigerated for reference. The presences of pink to red colonies with black centers are considered *Salmonella*. In the confirmatory phase, the pink to red colonies are selected and inoculated into TSI slants LIA slants, and urease broth. All are incubated at 24 ± 2 hours at 36 ± 1.5 oC. The confirmatory phase tests are evaluated as positive or negative, depending on specific color reactions. The TSI slant undergoes an additional conformation step using polyvalent O antiserum. In order for the original TSB tube to be considered positive for *Salmonella*, the associated inoculations should MSRV positive, XLD positive, TSI or LIA positive, urease negative, and polyvalent O positive. Failure in any of these tests constitutes a negative *Salmonella* reaction.

PERFORMANCE AND COST CONSIDERATIONS FOR MONITORING OF *E. coli* IN WASTEWATER

This rule specifically requires NPDES facilities that monitor and report the presence and enumeration of fecal coliforms in wastewater to now report the presence and enumeration of *E. coli*. The table below may be used as a guide to help determine which method is most appropriate for your facility.

To learn more about EPA's new microbiology test procedure rule, go to <http://www.epa.gov/waterscience/meth>

Performance and Cost Table

Media/Method	Method Performance False Positive— False Negative Ratios	Initial Startup Costs	Cost Per Test
Modified m-TEC (EPA 1603)	3.1%–4.8% ¹	\$660 ²	\$4.42 ³
m-ColiBlue24® (Hach 10029)	2.3%–4.9% ⁴		\$2.65 ³
Colilert® (Standard Method 9223B)	6.7%–15.8% ⁵	\$3,600 ⁶	\$6.72 ⁷
Colilert-18® (Standard Method 9223B)	11.9%–21.6% ⁵		\$7.22 ⁷

1 Data cited from "Results of the Interlaboratory Validation of EPA Method 1603 (modified mTEC) for *E. coli* in Wastewater Effluent," EPA Docket ID OW-2004-0014-0004.

2 Typical cost derived from Hach Company Catalog and is for single filtration manifold.

3 Typical cost derived from Hach Company Catalog and is includes media, agar plate, and filter.

4 Data cited from "Results of the Validation of m-ColiBlue24® Media for Enumeration of *E. coli* in Wastewater Effluent," EPA Docket ID OW-2004-0014-0061.

5 Data cited from "Study Report for the Proposed US EPA Approval of IDEXX's Colilert®-18 and Colilert® for the Detection and Enumeration of *Escherichia coli* in Wastewater Samples," EPA Docket ID OW-2004-0014-0011.

6 Typical cost derived from Weber Scientific Catalog and includes Quanti-Tray® sealer and UV lamp.

7 Typical cost derived from Weber Scientific Catalog and includes media and tray.

Environmental Possibilities for Agriculture

—By Floyd B. Johnson, Co-Editor

There's a good bit of know-how and no loss of actions to take for improving water quality in the Chesapeake Bay watershed, it's the ways and means that must be found. A massive undertaking will be needed to make agriculture a full participant in the Bay restoration effort. The good news is that kind of undertaking—with point sources—has been done before. The bad news is it will have to be done again with agriculture.

The book, *Omnivores Dilemma* by Michael Pollen, is an interesting read on how we humans decide what to eat. In this book, Mr. Pollen talks extensively about Polyface Farm in the Shenandoah Valley of Virginia. The philosophy of that farm, which produces cows, chickens, eggs and corn, is to work with nature. According to the farmer, it all starts with grass. Using finely tuned rota-



tional grazing principles, it all begins when the cows eat the grass and produce manure. Little nutrient import occurs, and when it does it is done as locally as possible. Admittedly this farm is operated with an effort not many farmers are willing to make, but it does show what is possible using natural means and cycles.

Most of the information in this article came from a white paper put out by the Scientific and Technical Advisory Committee (STAC) of The Chesapeake Bay Program (CBP). This diverse group takes on many Bay related subjects, and certainly few topics are as diverse as the environmental impact of the massive non-point source classified as agriculture activities.

In the Bay watershed, agriculture covers 23% of the land, provides 13% of the gross domestic product and employs 4% of the labor force. Farms in the watershed average 180 acres, making them smaller than the national average of 500 acres; however, the confined animal operations are very large when measured by density of animals per acre. A consequence of this situation is that of the over 2000 watersheds studied in the U.S., key Bay watersheds rank in the top 10% in terms of manure nitrogen runoff, leaching, and loading from confined animal operations. Obviously substantial changes have to be made to animal operations.

To better understand agriculture, it is good to keep in mind the large and small players. Nationwide, and the Bay region is no different, 10% of the farms produce 85% of the revenue. That doesn't follow that 10% necessarily produces 85% of the pollution but it does give an indication

where the main effort should be directed. Another fact gives even more illumination; only 12% of family farm income comes from agriculture. Most farmers farm by choice and not necessity. Or until they raise the final crop and sell out to the highest bidder. There is hope in these numbers. If we concentrate on the biggest operations and people who can't cry poor when they have to spend money, some serious shovel fulls could be taken from the large pile of pollution produced by agriculture.



Very large poultry businesses make their home in the watershed and they are the source of considerable nutrients. Here are some recommendations to improve their operations:

1. Continue and expand the use of phytase and other diet refinements. Phytase has already proven to reduce excreted phosphorus by 18%. It is estimated that better use of Phytase along with diet refinements and other additives could reduce phosphorus by 40–50% from original levels. More research is needed on how much nitrogen in the feed is needed and how that nutrient passes through the birds. This takes the problem back to the source of food for the birds, the feed industry. If the Bay states could enact a phosphorus ban on soaps and detergents, then why can't it do this?
2. A better system is needed to handle the surplus manure nutrients. Whether it is making fertilizer, compost, or bioenergy, those uses should be pursued to minimize manure nutrients to build-up or be trucked long distances out of the watershed.
3. Ammonia losses and their impact on air and water need to be studied more fully. Ammonia is a considerable problem that nothing much has been done about.
4. Nutrient Management plans are a start, but we must go further. Nutrient Balance Plans, are needed on a farm and regional basis to stop the build-up of nutrients. These plans use a tracking system for nutrients brought into an operation through feed and fertilizers, and nutrients leaving through excrements, field runoff and leaching.



While the total number of cattle has been stable in the watershed, the animals are becoming more concentrated on fewer farms and are a large source of nutrients. Here are some recommendations for this area of agriculture:

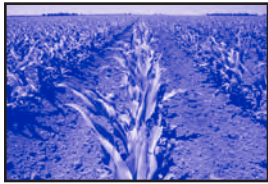
1. The same as with poultry, the feed must be looked at to find minimal nitrogen and phosphorus concentrations that will support proper nutrition of the animals. Since cattle have more efficient digestion systems, many possibilities exist for the crops they eat to be optimized to

reduce excretion of excess nutrients.

2. Manure issues are similar to the poultry industry, but they have a different twist. Unlike the concentrated poultry operations, cattle farms are more spread out which means the solution will need to be more diverse. The same type ways of handling manure apply to cattle, except more attention will need to be paid to local conditions.

3. Atmospheric impacts of ammonia need to be more fully evaluated to better control nitrogen flows. Those more efficient digestion systems produce more nitrogen based gases.

4. The same as poultry, nutrient balance plans are needed. With the more spread out nature of cattle farms, area cooperatives will be needed to handle manure quantities. In a sense nutrient balance plans for farms are a kin to the nitrogen caps being applied to wastewater treatment plant discharges.



Corn, wheat and soybeans are the most commonly grown crops in the Bay watershed. These crops are not efficient users of nutrients, taking up only 40–60% of applied nutrients, which results in high losses to ground and surface water. The following recommendations would ease nutrient losses:

1. Better study nitrogen and how to apply it to maximize uptake and minimize losses. This includes soil analysis, combined with crop cycles, and the timing and rate of applications.

2. High phosphorus soils should be remediated and cropping systems should be developed that lower soil phosphorus levels.

3. The use of hay and row crop rotations has the potential to reduce nutrient losses and more research is needed to develop rotations that will support viable farm operations. Also low or no-till farming practices, which reduce erosion and increase carbon sequestration, should be expanded.

4. Technologies and systems to combine manure and fertilizers applications to meet the nutrient needs of a soil would improve nutrient utilization. To assess the effectiveness of applications, on-farm sensors should be used to monitor conditions.

5. Improve and expand the planting of cover crops, especially cereal and leguminous crops. Not only is the type of cover cropping important, but also the timing of the planting is equally important. If crops are planted too late in the fall, the uptake of nutrients will be limited.

6. Pursue low-impact crops such as perennial native grasses and trees, which not only greatly reduce nutrient losses, but also have the potential to bring in new revenue from the growing bioenergy market.

While not as impact producing as animal or field crop farms, nursery and greenhouse operations are playing a



larger nutrient role. These operations are the fastest growing sector of agriculture. Maryland has approximately 1,000 nurseries and greenhouses that cover 10,000 acres and grow over 400 plant species. These operations are heavily fertilizer dependent and many of the same recommendations made for the larger sectors of agriculture apply. To reduce nutrient losses, a nutrient management plan, which captures runoff or leachate and promotes better watering methods such as drip irrigation, should be in place.

Best Management Practice (BMP), a familiar term, is talked about extensively in the STAC white paper. Back in the 1990's, when the CBP began to use BMPs to quantify nutrient reductions from agricultural practices it was the first attempt nationwide to tackle this difficult issue. As much as this should be applauded it needs to be advanced further. The current set of BMPs over-estimate nutrient reductions resulting from their implementation because they are based on ideal rather than more real world conditions. Much like the recent EPA retooling of the MPG rating for all vehicles to reflect more typical driving habits, a similar retooling of BMPs should be undertaken. Research should be directed at establishing BMP efficiencies that represent variability in soil, climate conditions, implementation, operation and maintenance quality over time, for both animal and crop operations. This adjustment to BMPs will of course reduce the contribution agriculture is making to the Bay restoration effort. In the short term this will cause consternation in the political arena, but long term it should bring much needed money and focus to the domesticated animals and crops of the Bay watershed.

A related problem to the overly optimistic BMP projections is the uneven reporting of results by State agricultural agencies. Considerable fluctuation is seen between states and within a State from year to year. This, along with the BMP efficiency problems noted above, makes nutrient removal quantities very suspect. The mighty regulatory hand should reach here, to not only assure real progress, but to also see that our money is spent properly. Better cooperation, coordination and purpose are needed between the environmental and agriculture agencies. The original Clean Water Act in 1972 put into place a permitting system called NPDES that is familiar to many of us. A similar system using nutrient balance principles and BMPs would likely have a similar result that the NPDES had on wastewater treatment plants. Starting with the largest operations, this permit system could be rolled out to all farm operations. After all, what wastewater treatment plant does not have an NPDES permit?

Nutrient trading has become a tool gaining more use in the Bay Watershed. While this tool is recognized as being useful in reducing overall pollutant loads, a wall should be erected between point and non-point sources. It's apples and oranges. Point sources have well established, well documented empirical data; non-point
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Environmental Possibilities

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sources like agriculture with its highly questionable BMP performance, implementation and reporting, have dubious data. Until the agricultural house is made more orderly, nutrient trading between wastewater treatment plants and farms can only be called suspect.

If farmers are going to be asked to do more, then they needed to be given more. Better educational, technical, and financial assistance must be provided. Farmers get that kind of assistance now, except it has to go further. Government programs supporting agriculture is presently provided in three main ways; removal of land from farming which does protect water quality (as long as this land is not sold for development), crop subsidies that focus on crop yields (and not efficient use of nutrients), and cost-share agreements for BMPs (which until BMP practices are improved limited water quality improvements will be achieved). Government assistance, whether it be in cost-shares, incentives, grants or subsidies must consider environmental impacts along with agricultural economics. If all this isn't challenging enough, lessening the environmental impact of agriculture has to be done without any drop off in production. Ideally production will improve.

In order to enable agriculture to change behavior, it will require a different mind set amongst the governmental players. Starting with the most impaired watersheds, and

continuing throughout the entire Bay region, cost share support and farm grants should be applied to farms that demonstrate nutrient reductions. The six Bay States need to convince the Federal government that the Chesapeake Bay region has special agriculture needs that go beyond the current economics of animal and crop raising. Water quality must be brought into the agricultural economic equation. To improve their ability to obtain more federal assistance, the states must do their part in agreeing on standards, reporting, and regulation. The states also need to generate funds in the fashion of Maryland's Flush Fee to apply to agricultural improvements. How can the federal government be expected to participate if the states don't show that kind of leadership?

So what can we as individuals do to help? If you can, grow your own crops. This will not only teach you what is involved, but hopefully you will decide to practice environmentally friendly growing techniques that minimize or eliminate inorganic fertilizers and pesticides. Going further, you can support local, environmentally responsible agriculture in buying their products. Yes it will cost a little more than what you pay at the large chain grocery stores. Isn't your food worth more? Still further, you can join a CSA (Community Supported Agriculture). Many of these CSAs practice organic growing techniques. Being a member of a CSA, I can tell you, nothing tastes better than fresh local produce. And nothing feels better than to know where my food comes from and the farmers who grow it.

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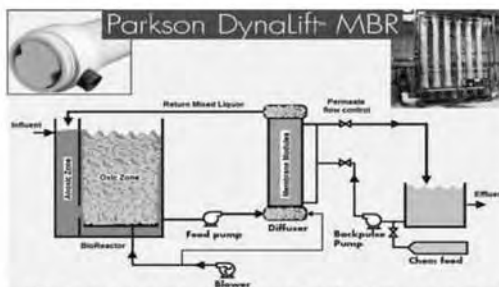
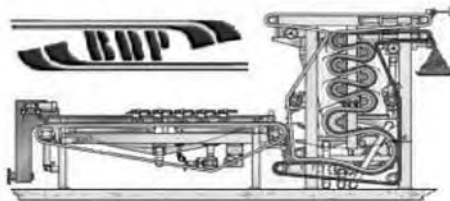
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BioEnergy: A Growing Source of Renewable Energy

—By Floyd B. Johnson

Until recently, with the major exception of hydroelectric power, little energy generated in this country was from renewable, sustainable sources. That is changing. As a follow-up to his Advanced Energy Initiative that has a goal of replacing of 75% of U.S. oil imports by 2025, President Bush said at the National Renewal Energy Conference in October 2006 that he sees great promise in the United States becoming the Saudi Arabia of bioenergy. In her speech, Patricia Woertz, CEO of Archer Daniels Midland and formerly head of refining at Chevron, stated that “we are at the beginning of the era of bioenergy.”

Consider that:

Ethanol production has gone from 2 billion gallons (BG) a year from 54 plants in 2000 to 5 BG/year from 100 plants in 2006; 44 additional plants are under construction.

Biodiesel from vegetable oil and animal fat is expanding even faster. Only 10 plants producing biodiesel were in operation 6 years ago; now there are 86.

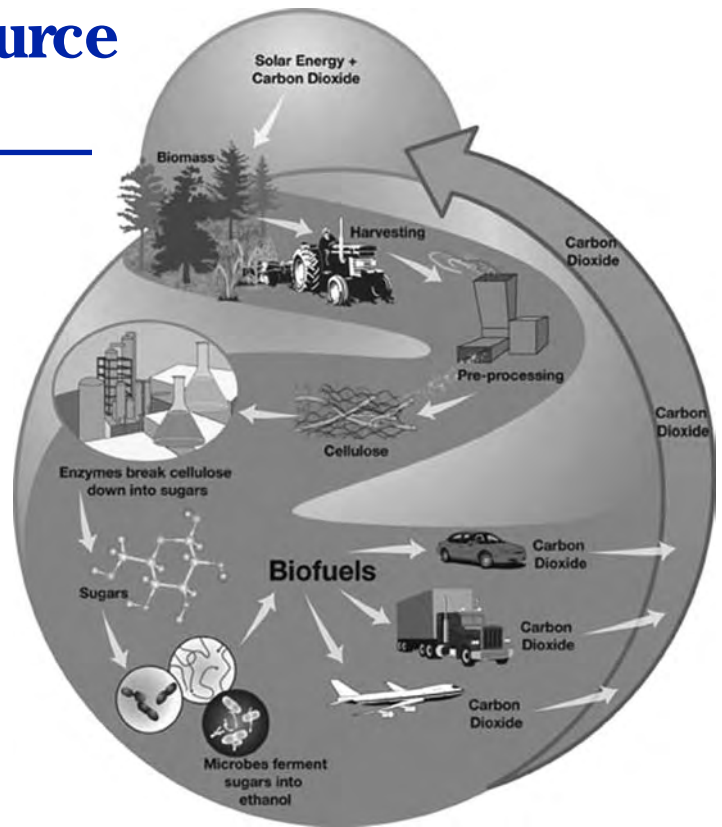
Daimler-Chrysler has announced that it will be putting 5% biodiesel fuel in all new 2007 Dodge Ram pickup trucks.

Every month, Willamette Valley Vineyards in Oregon offers up to 50 free gallons of a cleaner-burning biodiesel mix (made of waste from local restaurants and the nearby Kettle Chips factory) to its employees, who can fill up their cars right at the winery.

A revolution in how we produce energy is taking place and in the process, it will reduce greenhouse gas emissions, provide more energy independence and reshape our rural economy. More and more, instead of buying barrels of oil from foreign countries, the United States will be buying biomass by the bushel in the form of wood chips, nut shells, corn stalks, switchgrass and various animal residuals from domestic markets.

The most common way to capture bioenergy is to burn biomass, which comes from either living or dead plant or animal matter. The simplest example of this is what humans have been doing for thousands of years when they burn wood to create heat energy. But new advances in technology are now developing more efficient, cleaner and broader ways to use biomass. Liquid fuel conversion and gasification (cooking biomass under pressure without oxygen to produce combustible gases) are examples of these newer technologies. There also have been advances in the kinds of biomass that are used, particularly in the use of plants.

Plants are really a form of solar energy since photosynthesis makes plants grow. As they grow, they become



a natural battery for storing solar energy. More and more, crops will be grown specifically for energy. Trees and grasses native to a region are the best crops for this purpose. The United States is blessed with hearty, fast growing trees. In our northern region, poplar, maple, black locust and willow are particularly good for energy production, while in warmer southern climates there is sycamore, sweetgum and even eucalyptus. We also have an abundance of thin-stemmed perennial grasses such as switchgrass, big bluestem, reed canarygrass and wheat grass. These grasses grow naturally and can be harvested for 10 years before reseeding or replanting. Thick stemmed perennials like sugar cane and elephant grass grown in hot, wet climates are also good energy choices. In addition, annual grasses, corn, and sorghum can be used for energy but they must be planted every year and require more use of fertilizers. Plants like soybeans and sunflowers produce oil, which can be used to make fuel. Like other annuals, they require intense management activities. Research into a different oil-making plant is showing great promise. Microalgae are tiny aquatic plants that grow extremely fast in hot, shallow water. Similar to soybeans and sunflowers, the oil from these plants can be converted to fuel. An interesting area of development is the use of carbon dioxide emissions from power plants to stimulate microalgae growth in a win-win process that will reduce fossil fuel emissions and increase non-fossil fuel.

After the biomass from some plants and animals are used for other purposes, the leftover material and waste can be used for energy production. Forestry wastes—

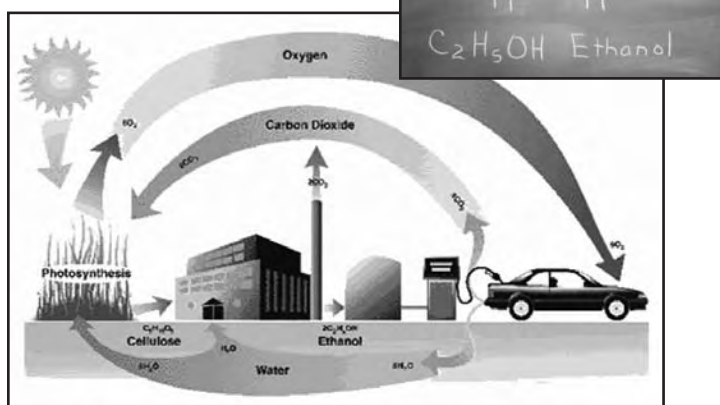
including tree tops, branches, bark, sawdust and the dried organic sludge from the mills—are a large source of energy right now since large lumber, pulp and paper mills use them to power their facilities. Agriculture crop residues that are usually left in the field can in some cases be collected for energy use. Excess animal manure can be also processed for energy. Leftover wood from construction and demolition, biodegradable garbage, and landfill gas can be all used for energy. In wastewater treatment, the biosolids removed during the treatment process are being used in growing quantities for energy production.

Until better technologies are more fully developed, biomass can be added to coal-fired plants to help reduce the burning of fossil fuels. In Iowa a power plant is under construction that will add switchgrass to coal, and in Maryland a large cement plant is co-firing coal with dried wastewater biosolids on a two tons of biosolids per ton of coal basis.

When plant matter is heated, it breaks down into gases, liquids and solids. By further processing, these byproducts can be refined into methane and alcohol, which can also be used in fuel cells. Carbohydrates in plants can be converted by bacteria, yeast and enzymes into energy. Fermentation changes biomass liquids into alcohol and bacteria work on biomass to produce methane. Biomass oils such as soybean and canola can be chemically converted to fuels similar to diesel or used as gasoline additives.

Several decades ago it usually took more energy to produce biomass fuels (taking into consideration the energy it takes to make the fertilizer, run tractors, etc.) than the fuels themselves contained. That is clearly not the case now. A 2002 U.S. Department of Agriculture study stated that ethanol production showed a net 34% increase in energy. Most ethanol in the United States is currently produced from corn kernels, but researchers are developing more efficient ways to produce it using the cellulose in inedible plants. If ethanol is made from plant cellulose materials, a 4- to 5-fold increase in energy is possible; if electricity is made instead, a 10-fold increase could be reached.

One important factor in the bioenergy equation is that



biomass contains less energy per pound than fossil fuels. That means that raw biomass will in most cases be converted to fuel or energy within 50 miles of its source, creating energy systems most likely smaller and more locally based than their fossil fuel counterparts.

Right now in the U.S., biomass provides 1.2% of the total electric sales and about 2% of the liquid fuel used in cars and trucks. The Department of Energy estimates we could produce 4% of our transportation fuels by 2010 and as much as 20% by 2030. For electricity, the Department of Energy estimates energy crops and residuals alone could supply as much 14% of our power needs.

Bioenergy brings environmental benefits such as reducing air and water pollution, increasing soil quality, reducing soil erosion, and improving wildlife habitat. By using the natural carbon cycle, where carbon dioxide is absorbed by living plants after the dead plants die or are burned, carbon dioxide emissions can be reduced by 90% compared to fossil fuel use because the carbon in the earth's ecosystem will be much more in balance. Sulfur dioxide emissions that come from burning coal and fuel oil would also be greatly reduced. Since energy crops require less fertilizers and pesticides, there would be less runoff into streams. Most high yield food crops take nutrients out of the soil, but energy crops such as native grasses build up topsoil and put nutrients into the soil and the infrequent planting that would be required minimizes erosion. Many of the energy crops would be native species, which attract a wider variety of animals, and harvesting can be planned around critical nesting and breeding periods.

In summary, bioenergy offers much promise with environmental, economical and security benefits. The air, water, soil and wildlife will improve, farmers and rural areas will gain demand for their products and land, and the United States will reduce energy imports and be less subjected to supply disruptions.

To learn more about bioenergy, check out the following sources:

The U.S. Department of Energy
Biopower and Biofuels Programs
National Renewal Energy Laboratory
Federal Energy Management Program

The U.S. Department of Agriculture
Renewable Energy Incentives
National Resources Conservation Service
The Energy Balance of Ethanol

Oak Ridge National Laboratory
American Bioenergy Association
Center for the Analysis and Dissemination of
Demonstrated Energy Technologies
Energy and Environmental Research Center
Union of Concerned Scientists

Thank You

—By Bob Wimmer

This past July I made a decision that I probably should have made about a year ago. In July I resigned as co-editor of this wonderful publication the *Ecoletter*. The time that I spent as co-editor was challenging, enlightening and educational. While I will greatly miss this role, I recognize that I had become an impediment to the orderly publication of the newsletter and this was not fair to our authors or the members of CWEA and WWOA.

I wish to thank everyone who has contributed articles through the years, the advertisers who support our publication and all of the members who have offered their compliments. In particular I want to express my deepest gratitude to Floyd Johnson, my co-editor who has always provided great insight and has put forth a tremendous effort on the *Ecoletter*, even in retirement. My great appreciation to our Editor Emeritus, Pearl Laufer who has always been an inspiration to me and to our graphics artists Debbie Donnelly and Amy Wilson, who make this publication look wonderful. The *Ecoletter* Editorial Board has put up with my wacky ideas and short deadlines and has always delivered with great content. More than anyone else, I want to thank my beautiful wife Lynn and our two wonderful daughters Abby and Becca, for putting up with time I have invested in the *Ecoletter*.

I am very thankful that Cynthia Lane has accepted the challenge of becoming co-editor. I am certain that she will be a great leader and will take the *Ecoletter* to the next level. I am most proud and excited that a fellow young professional is stepping up and taking a leadership role in our association and in our industry. As the baby boomers begin retiring the pool of workers will begin to shrink and it is critical that we get the new generation of **professionals** actively involved in our associations.

Professional. I want to focus on this word, as my final thought. Our industry has an image problem. When referred to in the press WWTPs are often described as a “source” of pollution. Typically we show in the paper when there is an overflow or broken pipe. Just as importantly, when we describe what we do we talk “treating wastewater” or operating a “sewage treatment plant.” I am just as guilty. When I talk with my daughters about what I do I will often say “I play with poop.”

The last 100 years of sanitation have allowed us to take for granted what we do and how vitally important it



Bob sharing some “down-time” with daughters Abby and Becca.

is to society. Our profession is the first and most important line of defense for public health. Without the modern sanitary sewer systems and treatment facilities, waterborne illnesses and intestinal disease would reduce the life expectancy by decades. We are also some of the most successful and influential stewards of the environment. Anyone can stand up for the environment and demand that additional regulation or procedures be implemented to protect the environment, but no group collectively does more to improve the environment than we do.

We have an opportunity in all of everyday activities to demonstrate the importance of the wastewater profession to society and the environment. We do not need to wait for others to praise our efforts nor should we. When we talk about what we do we need to state clearly that we make water clean and keep the community healthy. We do so in a professional manner and we should do so with great pride. Every member of this industry is a professional; operations staff, maintenance personnel, lab analysts, management, engineers, consultants, vendors and regulators. We must always remember that we are professionals, performing a noble task, for the betterment of our world. We must remember that if we do not consider our work to be important and critical to the betterment of society and the environment, then everyone who flushes a toilet and thinks the sewage magically disappears will never appreciate what we do.

Take pride in what you do, for there are few who willing to get their hands dirty to make this world a better place. We are amongst those few.



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Sewer CCTV and DOT is a Perfect Match

—By Ted DeBoda, P.E., URS Corporation and
Kevin Penzoza, P.E., New Castle County

Upon investigation of a sinkhole in a residential collection system, you see dye flowing directly from the hole to the broken joints, holes, or collapse in the 50-year old Terra Cotta pipe. It's not long before you realize either from local residents, the State Department of Transportation, or observation that a dig-up will require restoration of a road that was overlaid within the past year.



Old Roads, Older Sewers

As our sewers get older, our roads can be paved 3 or more times before the sewers underneath are even considered for repair or replacement. This is not just an out-of-sight out-of-mind phenomenon. Properly installed sewers are not subject to the stresses experienced by our roads and other “surface” infrastructure. However, they too will eventually fail, and depending on the age of the sewers, there is a fair chance they will fail within a year or less of a road resurfacing.

More and more municipalities are realizing, many times through an unfortunate experience, that CCTV should be considered for all older sewers under roads scheduled for replacement. Generally, the most expensive part of any sewer project is road restoration. Early assessment of sewer pipes identifies problems that can be repaired either before or in coordination with road projects. It also helps reduce a well deserved public perception that lack of communication between government agencies can cost millions of tax dollars.

New Castle and DelDOT Coordination Program

New Castle County established a “Coordination Program” to establish active dialog between the county and Delaware Department of Transportation (DelDOT) in 2004 to address this concern.

New Castle County maintains approximately 1,500 miles of sanitary sewers over a 426 square mile service area. DelDOT is responsible for maintaining most of the roadways within the county. While there was a 5-year moratorium on utility work within newly resurfaced roads, emergency sewer projects within this period were common. There were utility meetings for major DelDOT projects, but they were often scheduled after the project had been awarded, and there was no time to assess the sewer lines and perform the necessary repairs before the road work. Further, these meetings involved major improvement projects, and did not address the paving projects within local communities and other roads where the county maintained many of the collector sewers.

Through a series of meetings with DelDOT managers, the county learned of three categories of road projects. These categories have different timeframes for DelDOT execution, which present different construction windows of opportunity for the county sewer repairs.

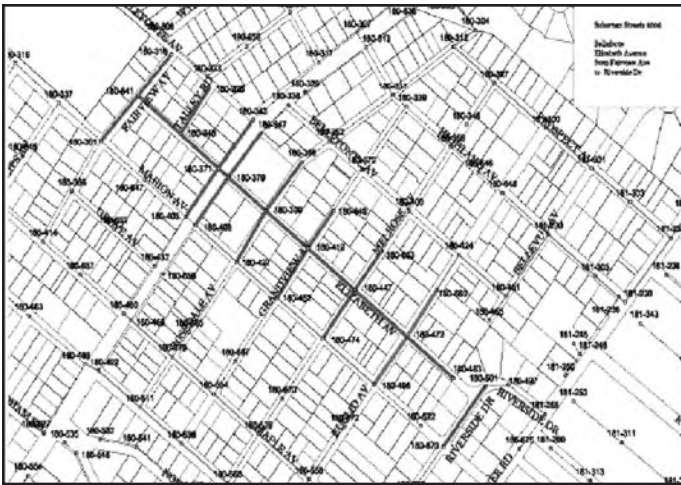
- Community Transportation Needs (CTN) projects are funded by local state representatives to mill and overlay neighborhood streets. There are up to 10 CTN contracts per year, and each contract can effect 30 different locations. Contracts are generally organized in late September and construction begins in March.
- Pave and Rehab (P&R) projects were generally to mill and overlay some of the more major local roads. The annual number of contracts varies from year to year, and is driven by the yearly capital budget. Contracts are organized in late Spring and construction begins Spring of the following year.
- Major Infrastructure Improvement projects include the larger scale initiatives such as intersection improvements and road widening projects. These projects can take a year or more from the time the project scope is identified until construction starts.

Program Steps

As DelDOT releases information concerning their projects, New Castle County must generally work within the project time constraints to progress from identifying if there are sewers within the project areas to making required repairs before the DelDOT work.

Identify the project area sewers

When the lists of each of these locations are received by the county, they need to be reviewed to determine if there are sewers within the project area. This is done very efficiently using Geographical Information Systems (GIS). By overlapping DelDOT project

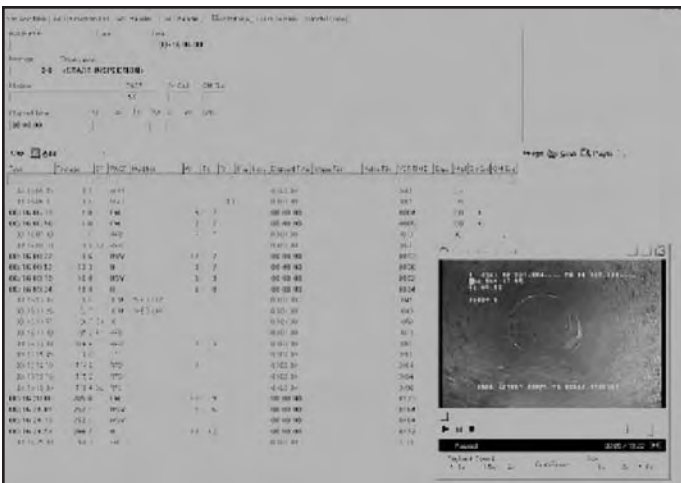


coverages with sewer coverages, those intersections provide a list of all the sewers impacted or potentially impacted. In addition to sewers directly in the project area, it is important to include those that may be included in the project since scope expansion for paving projects is common, particularly if the condition of surrounding roads is poor.

Prioritize the Sewers

The list of sewers under road projects is extensive, and lines selected for CCTV need to be further refined. An effective and accurate asset management system is important to this refinement process. The list of assets (in this case sewer lines) can be reviewed against existing databases or construction drawings to determine pipe size, age, and material. They can also be reviewed against maintenance problems using the county's automated work order system and discussing projects with operations personnel. All of this information is reviewed to prioritize lines for CCTV. Older lines with extensive maintenance histories are scheduled for CCTV, while newer pipe with no known problems may be eliminated from the list.

New Castle County maintains their CCTV work using the Cobra Information Management System (CIMS) software. The list of lines can be reviewed to determine if



CCTV had been performed previously, and reports and video can be recalled from the CCTV server rather than paying for a new CCTV of the line.

Assess the Sewers

The next step requires a standardized CCTV system for several reasons. First, PACP insures all observations are uniform and accurately reflect the observations with consistency. Also, since there are several steps involved in the assessment process, the use of a standard software program allows all reviewers to use the same report retrieved from a central server.

KCI, New Castle County's sewer consultant, performs an initial review of the CCTV video and reports to determine which sewers require work. New Castle County engineers then review them to decide the most appropriate rehab method.

CONSTRUCTION REPAIRS 25-031-04 BROOKLAND TERRACE					
CCTV START MANHOLE	CCTV FINISH MANHOLE	CONSTRUCTION REPAIRS	MPEG ID #	IN LIMITS	OUT LIMITS
201-642	201-266	Force Repair @ 118.74 (TBA)	BT 2-2a	X	
201-648	201-367	Force Repair @ 5.30 (TBA)	BT 3-4a	X	
201-648	201-367	Force Repair @ 8.40 (TBA)	BT 4a-4b	X	
201-648	201-367	Force Repair @ 32.5H (TBI)	BT 4b-4a-4f	X	
201-648	201-367	Force Repair @ 32.5H (TBI)	BT 4b-4b	X	
201-267	201-620	Force Repair @ 274.4H (TBI)	BT 6-6a		X
201-2-2	201-317	Force Repair @ 354.1H (SPV-2.2%)	BT 7-7a		X
201-267	201-367	Force Repair @ 106H (TBSV)	BT 6-6a	X	
201-367	201-367	Force Repair @ 197.7H (TBA)	BT 9b-9c	X	
201-657	201-667	Force Repair @ 20.8H (TBA/FB)	BT 6-6a	X	

Fix the sewers

If the sewer needs to be dug up to be repaired, it needs to be programmed within the time constraints of the particular projects. These project scopes include anything from mainline spot repairs of a collapsed pipe or service connection to complete replacement of pipe and manholes.

Other deficiencies that can be repaired using trenchless technologies are identified for future work. Since this project requires assessment of so many older sewers, this list can be extensive.

Hurdles

Coordinating projects between State and County agencies raises many obstacles. Different funding sources, different schedules, and different priorities have introduced several challenges.

Project Bidding

Time constraints from DeIDOT frequently do not allow enough time to competitively bid these projects.

Continued on page 28

CCTV and DOT a Perfect Match

Continued from page 27

Projects are often performed using emergency bidding procedures. This requirement can be eliminated by awarding blanket contracts annually for the work expected from this program.

Add-on Locations

Paving projects can easily expand in scope, particularly if surrounding roads are in poor condition. It is important to make assumptions early in the process that these projects will expand to some of these roads, and identify the effected sewers appropriately. Sometimes, the sewer requirements can have an impact on the scope of the paving project if sewer work is required just outside the initial project area.

On going communication between New Castle County, DelDOT, and State Representatives provides the opportunity to discuss potential scope changes early in the process.

Contractor Scheduling

Even when the blanket contracts are awarded, assessment and engineering phases need to be expedited to allow time for the contractor to mobilize and complete the work before the DelDOT contract commences. Sewer projects identified later in the process due either to project add-ons or assessment delays can sometimes be accommodated by altering the DelDOT contractor's construction sequence to provide additional time to work in a certain area.



Achievements

This program is extremely successful, not just in avoiding the need for emergency sewer projects in newly paved roads. It provides the county with a logical and effective tool for accessing manageable pieces of their 1,500 mile sewer system each year. By narrowing the CCTV work to higher priority lines based on age and material of pipe, the work is very productive.

Since starting the program in 2004, over 380,000 linear feet of sewers have been assessed using PACP. As a result of this project, almost 8,000 linear feet of pipe and 13 manholes have been replaced, and 174 point repairs have been made.

This program has been extremely successful to the county, DelDOT, and the state representatives. There is consistently a favorable response from the public when the program is described at public meetings. As a method of identifying and repairing deficiencies, it has contributed to the county's consent decree.

Even more important is what has NOT been done. No new roads have been dug up since the program started.

Delaware Operator Awards

Continued from page 13

great strides, water operator's work is as critical as ever. Baker took on leadership roles and for such is considered a leading manager in the field. His contributions are vital to the expansion of Artesian, Robert Brock of Artesian explained. Baker was as much honored as his peers were. He loves his job and is proud of his work in a community sustaining industry. He finished by declaring how he wants to support a high quality product. But, Baker added, "That would not be possible without the hard work of everyone."

Nominations also included the following operators in Delaware:

Anthony Dellacamera, Sussex County Engineering Department

Ed Dobos, Tidewater Utilities

Stephanie Dukes, Slaughter Neck Community Action

Mike Evans, Kent County Department of Public Works

Mark Kondelis, Artesian Resources

William McCabe, Town of Selbyville

G. Dean Melvin, Perdue Family Farms

Stella Padilla, Kent County Department of Public Works

William Vincent, Kent County Department of Public Works

Environmental Lifetime Achievement Award

This award recognizes the water industry professional for sustained meritorious achievement and contributions to Delaware's environment.

The following environmental professionals are recipients:

F. James Burke, Town of Selbyville

Ken Cross, Tidewater Utilities

James Harrington, Artesian Resources

G. Dean Melvin, Perdue Family Farms



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Encouraging Mechanical Aeration to Improve the Chesapeake Bay

—By Bob Andryszak, Ecoletter Staff

For a number of years I and some colleagues have been proponents of using mechanical aeration devices as an interim short-term means of increasing the dissolved oxygen (DO) concentration of portions of the Chesapeake Bay. Occasionally, there is an article in the *Baltimore Sun* about a person who has a novel idea for Bay aeration, but invariably the concept does not come to fruition, seemingly due to lack of funding or lack of support by either a government or large “Bay” agency. I know of no actual installation of an aeration system to augment the natural DO concentration that is in place at this time on the Bay or in its smaller estuaries. I recently read the technical paper “Can Windmills Save the Bay?” by the Scientific and Technical Advisory Committee (STAC) of the Chesapeake Bay Program and listened to news media accounts of the Chesapeake Bay Foundation’s (CBF) annual report on the state of the Bay. The two reports caused me again to consider that the Bay aeration idea has a great deal of merit and that it should be funded and tried with the support of Big Science and Government (read that as the Center for Estuarine Studies, the Chesapeake Bay Foundation, the EPA, and MDE).

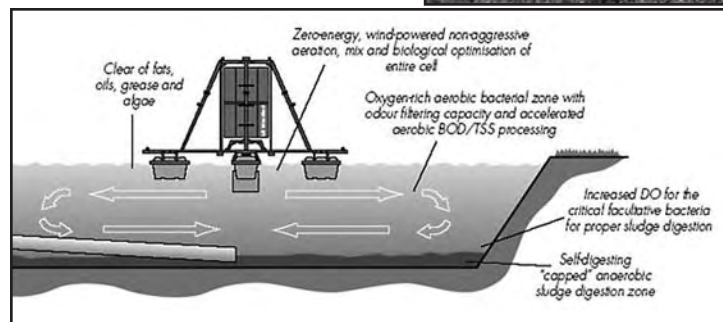
The STAC paper was a review of a proposal by J. Adam Hewison to aerate the Bay using wind-powered aerators. The STAC paper discouraged the idea of increasing DO concentrations using wind aeration, summarizing “...to aerate the Bay with windmills addresses a symptom, not a cause of the Bay’s problem. Reducing nutrient inputs is the only (emphasis added by this writer) long-term solution to extensive hypoxia in the deep waters of the Chesapeake Bay.” The STAC cited concerns over disrupting natural circulation patterns, increasing algal production, and navigational obstructions as well as the extremely large size of the Bay in dismissing the concept as not being feasible. While I concur that nutrient inputs to the Bay must be reduced, the message sent by STAC is analogous to a cardiologist “treating” his patient who’s having a severe heart attack by pronouncing “You’ve got to change your diet and start exercising and then call me in five years to confirm you’re feeling better.” I say there’s a lot to be said for administering first aid in the short-term to extend a life in place of an obituary saying the patient should have dieted and exercised.

Considering that STAC is an influential organization in Bay matters, the paper conveyed unfortunate messages.

- 1) The paper not only dismissed the feasibility of aerating the Bay’s deep waters, it implied it would be futile to use supplemental aeration elsewhere in the Bay because it would not help reduce the

main stem’s hypoxia. I contend that aeration in the Bay’s smaller estuaries, rivers and creeks would be beneficial in those waters with consequential benefits to the main Bay.

- 2) The paper cited nutrient input reduction as being the only long-term solution to reducing hypoxia in the



Bay’s deep waters. I wonder what happened to the need to address excessive sediments, unchecked population growth, a half-century of flushing pharmaceutical products into the Bay (the so-called emerging contaminants), as well as the nutrients that have already entered the Bay?

While the STAC paper discouraged the implementation of a concept that could only help the Bay in the short-term, the CBF’s annual report reminded me of the very extensive work ahead in significantly improving the Bay in the long-term. The CBF’s report was issued in mid-November 2005 with the Bay’s overall grade being 27 out of a possible 100 points. If my memory is correct, the CBF’s annual grade seems to have been stalled near the 27 value for the past few years in spite of considerable study and action for two decades to improve the Bay. While many CWEA/WWOA members may question the details of the CBF’s methodology in developing its grade, I do believe it’s a valid data set that’s noteworthy when considering the overall health of the Bay. It confirms my own observations of the upper Bay that we’re in a holding pattern based on my more simplistic observations of SAVs, water clarity, and seafood harvests.

The long-term Big Government and Science programs and initiatives to improve the Bay are challenging and daunting in their size and complexity, yet they are

necessary because it is socially unacceptable to have an estuary with only phytoplankton and copepods as the backyard of tidewater Maryland and Virginia. Fortunately, several major programs and initiatives are in progress (and others should be in progress), but realistically their results won't be seen for another decade or more. For instance:

Maryland's enhanced nutrient removal (ENR) strategy at the 66 major wastewater treatment plants will not be completed for several more years. A few facilities already achieve very low levels of effluent total nitrogen (3 mg/L) seasonally and much progress has been made on reducing phosphorus discharges to the 0.3 mg/L goal. Construction for ENR improvements has started at a handful of facilities, but limited progress has been made for over 90 percent of the flow from these point sources.

Pennsylvania's biological nutrient removal (BNR) program has just started for the 140 plants that are targeted in the Susquehanna River's watershed. The Susquehanna River provides approximately 50 percent of the freshwater input to the Bay and it carries those nutrients and sediments from eastern Pennsylvania.

Virginia's State Water Control Board only recently established its rules for nutrient removal from wastewater treatment plants and Governor Warner is to propose funding for the necessary improvements. It is expected that a multi-year timetable will set to complete the work.

One of the goals of Governor Ehrlich's recently-announced Clean Air Plan is to reduce nitrogen oxide air pollution by 69 percent by 2010 from coal-fired power plants in Maryland. We all know that the effects of air pollution are much more far-reaching than state boundaries. What is the actual timetable for reducing air-borne nitrogen pollution from Ohio, Indiana, and Illinois?

I know of no timetable for addressing for the removal of the ever-increasing build-up of sediments from behind the Conowingo Dam on the Susquehanna River. The need to do so can be seen by comparing recent events in wet and dry weather periods. Tremendous amounts of sediments are transported to the upper Bay after large rain events in Eastern Pennsylvania. In the Autumn of 2004 two storms carried a tremendous amount of sediment, logs, trees, and debris at least as far south as the Magothy River. The water was literally brown with no significant sunlight penetration into the water column and in effect, the upper Bay was environmentally damaged. In contrast, there was little rain during the Summer of 2005. Vegetation sprung-up throughout the Susquehanna flats and the water clarity was excellent. It was called a view of what we want the Bay to be.¹ The daunting task of Big Science and Government, including the federal government, is to make room behind the Conowingo Dam to trap sediments before another disaster for the Chesapeake occurs such as Hurricane Agnes did in 1972.

Then, there's that little issue about reducing the non-point source pollution which contributes approximately 23 percent of the nitrogen...

The obvious theme is that these initiatives are

long-term programs that will not produce immediate, measurable results. Their results will be seen in an incremental fashion years from now probably through the attainment of a "tipping point" where the cumulative beneficial effects will be seen. So what can we do in the interim years until these big projects take effect?

Let's face the fact that the Bay's water column and sediments are undesirably enriched with pollutants that would benefit from being aerated. Yes, we fully understand that DO oxygen augmentation is not the entire solution to the Bay's ills, just as we understand that first aid for serious illnesses is to be followed by more in-depth medical treatment. Why shouldn't there be an attempt to oxygenate a localized area in the Bay to create an "oxygen oases" and observe the effects? We would be creating a zone that is in an oxidative state (a high DO zone) to support both the desirable commercial aquatic species as well as the microorganisms that could treat the pollutants that are deposited in that area. In *Turning the Tide*, Tom Horton relates of watermen moving crab pots from deeper to shallower waters that have a higher DO concentration. The pollutants now exist in the Bay sediments and water column as result of our failure to catch them before they exited our wastewater treatment plants, farms, industries, paved roads, exhaust stacks, and exhaust pipes. Aerating selected slow-moving rivers and creeks that receive wastewater treatment plant discharges, such as the Corsica River from Queenstown, MD and the Warwick River in Secretary, MD could be thought of as extending the wastewater treatment facilities that discharge to those water bodies. In effect we would be adding energy to the Bay to augment its natural assimilative capacity. It could also be thought off as being analogous to in-situ treatment of contaminated soils and groundwater.

Yes, aeration on a significant scale is potentially energy intensive and it's not realistic to think it's appropriate for the entire Bay. Also, there are ways other than using windmills to aerate. We should be thinking in terms of harnessing the wind, the tides, and solar radiation as aeration energy sources. Submerged diffused aeration systems can be installed that are not navigational hazards. Tax credits could be given to individuals for electrical costs to operate blowers from their piers.

Supplemental aeration is a relatively simple concept that would be beneficial for the Bay which can be readily implemented by individuals, by private organizations, towns and counties much more quickly than the Big Science and Government programs that are underway. It was pointed out to me that mechanical aeration is a concept that individuals can implement and feel like they're being proactive in improving the Bay.

¹ *Baltimore Sun*, September 15, 2005 "Grasses revival a bright spot for the bay" by Candice Thompson.

CWEA President's Message

Continued from page 3

and postal mailing purposes. I request you to update your profile whenever any changes occur.

We have a web master (Anthony Rocco) and he is doing an excellent job of keeping our web site current with all the CWEA news. Make sure to periodically visit the CWEA website at www.wwoa-cwea.org for latest information.

I am looking forward to seeing you all in August at the Joint Conference in Ocean City, MD. The Conference Committee has worked very diligently throughout the year to plan the conference and have put together an excellent program. There are number of excellent paper presentations planned along with some really interesting vendor displays. Come, enjoy the conference, and meet old friends.

Thank you for providing me the opportunity to serve you this year. It has been fun and rewarding. I plan to continue to serve on some of our committees and be an active member of the organization. I hope you all will also be active members of the organization by participating in

WWOA President's Message

Continued from page 3

the conference planning, you will be impressed with the level of work and dedication provided by the volunteers who pull it all together each year for the benefit of the membership.

A committee was selected to represent WWOA in the planning of the 2008 Tri-Con with CWEA and CSAWWA. Numerous sites were considered by the committee before deciding to return to Ocean City with the hope of utilizing the convention center for conference exhibits' and training sessions. I'm sure details will follow in future messages from your next President, DuWayne Potter.

Again, thanks for your support and don't forget, you can volunteer!

A Road-MAPP for Success

Continued from page 9

Renewal/Replacement Planning—Capital improvement planning driven by accurate condition assessment/monitoring and maintenance information with projects prioritized by a criticality framework. CIP projects include O&M Readiness practices and a complete maintenance program analysis to ensure proper staff and resource budgeting.

Financial Plans—Short- and long-term budgeting and funding strategies match asset management principles and program requirements. Goals include proper funding levels to avoid deferred maintenance.

Performance Metrics—A regular reporting program that includes a list of regulatory, customer, and internal staff metrics/measures to monitor and maintain desired performance levels.

Organizational Framework—Departmental silos are minimized, MAPP programs are designed, implemented and monitored at a corporate level, and MAPP principles are daily policy.

Documented Policies/Procedures—Asset management processes including planning/design/construction, maintenance, renewal/replacement, and associated MAPP policies are documented and reviewed annually.

Document Control—A program where new asset documents (vendor, as-builts, and O&M manuals) and engineering programs (CAD and standard specifications) are

fully maintained and coordinated with facility management programs.

Technology and Data Management—A program with the most appropriate technologies (CMMS, CAFM, BMS, EMS, financial) in place (and integrated, as appropriate) to support all MAPP principles. The program must include appropriate staffing levels to keep the technologies up to date and control data input for accurate reporting.

Risk/Criticality Framework—An appropriate prioritization process developed by key stakeholders and including likelihood/probability and consequences of failure. The framework is a foundation element that applies to all asset prioritization, maintenance program selection, and renewal/replacement planning.

Training and Communication—Active annual training programs ensure that staff possesses current knowledge of asset management principles. A Communication Plan regularly publicizes MAPP performance and effectiveness.

Leading Change Effort—A corporate sponsor and guiding coalition/steering committee made up of key business unit leaders develop the program's Mission and Vision including identifying and supporting internal change agents.

John W. Fortin, an innovator in the facilities and infrastructure asset management field, has over 20 years of diverse facility "lifecycle" experience. Mr. Fortin is the founder of the New England Water Environment Association's (www.newea.org/AMRC) Asset Management Committee.



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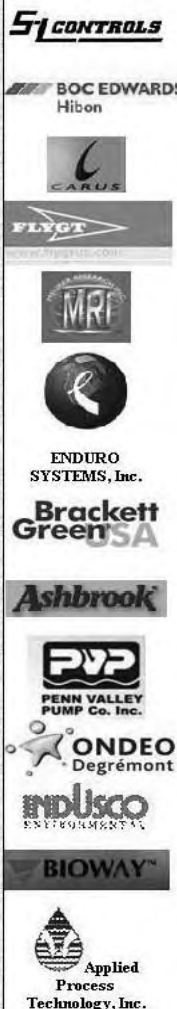
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