

CHESAPEAKE



Ecoletter

WINTER 2002 ISSUE



BIO-SOLIDS, ENERGY, AGRICULTURE...



They all go together.

Photo courtesy of
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A Publication of the Water and Waste Operators
Association of Maryland, Delaware, and the District of Columbia, &
the Chesapeake Water Environment Association



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CHESAPEAKE

Ecoletter


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**Calendar of Events
 Spring - Summer**

	S	M	T	W	T	F	S
May 10, 2002							Tri-Association Spring Meeting, Dalecarlia Treatment Plant Washington, D.C. <i>(see page 7 for details)</i>
May 16, 2002							First Annual WWOA Golf Outing, Twin Shields Golf Club Dunkirk, MD (Calvert County)
July 9-12, 2002							CWEA-WWOA Joint Conference Ocean City, MD
Sept 28-Oct 2							WEFTEC 2002, Chicago, IL
Feb 19-22, 2003							WEF/AWWA/CWEA Joint Residuals and Biosolids Management Conference Baltimore, MD <i>(see page 8 for details)</i>

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.

Change of Address

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

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 22 Nathan Way
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Presidents' Messages



CWEA President

—Russ Sharpe

At the WEFTEC 2001 Conference in Atlanta, three CWEA members received special recognition. Larry Jaworski was elected as WEF Vice-President, which will lead through automatic advancement to WEF President-Elect next year and WEF President the following year. Larry has been a very active member of CWEA, serving on several CWEA and WEF committees, as well as serving as CWEA President and Federation Director. Larry is an excellent choice for this position. Pearl Laufer (Maryland Trustee and *Ecoletter* Co-Editor) received WEF's Public Education Award at the Awards Ceremony. Last, but not least, Dorian Tolbert began his three year term as one of CWEA's Federation Directors, joining CWEA's other Federation Director, David Kappe.

The Chesapeake Water Environment Association Officers and Committee Chairs have been busy working on goals that were established at the Annual Meeting last July. One of the major themes for this year has been working more closely with WWOA and CSAWWA. As all our members are getting busier at work, it is important to share our limited resources between the three organizations. The three organizations are meeting to discuss ways to work together more effectively. We are exploring combining some committees into joint or tri-association committees. CWEA is working with CSAWWA to hold a joint Spring Meeting, to be held May 10, 2002. In addition, planning for the third Tri-Association Conference in 2003 is starting.

CWEA has established a Plant Operations and Maintenance Committee; Tom Heikkinen has agreed to be the Chair of the new committee and Scott Wells is the Vice-Chair. Tom and Scott are busy recruiting members for the Plant Operations and Maintenance Committee and developing activities for the new committee. At the November Board Meeting, a new Finance Committee was established. The Finance Committee will develop the Budget and review the financial operating procedures of CWEA. The Past-President, President, Presi-

Continued on page 5



WWOA President

—Bill Shreve

I hope this message finds everyone doing well and prepared to face the challenges the New Year brings. As if we didn't have enough things to occupy our time, we now face taking a hard look at security issues and solving problems we never thought about before. The events of September have impacted our lives in many ways and increased the already heavy burden we have to protect the customers we serve. Shortly after September 11th someone broke into the chemical feed room of one of our small water pump stations. We had no way of determining if the intruder had contaminated the water supply, and after lengthy discussions with state officials, had to take the water system off-line. The system had to remain out of service pending the completion of testing by the Department of Health and Mental Hygiene. It took three days to get the results back and we had to deal with supplying water to the customers in this community. Fortunately, it was a small residential system serving 32 homes. We had to supply bottled water for drinking, a tanker and containers for water (to use for flushing toilets, etc.) and work with the local college to provide shower facilities. This experience caused us to take a hard look at security issues for our facilities. We have made many security improvements, developed standard procedures to protect our facilities and our customers, and forged new relationships with local, state and federal law enforcement agencies. All of this comes at a cost during a time when many utilities are already strapped for funds to keep up with recent regulatory changes.

Now more than ever we need to band together and pool our resources to overcome the challenges we all face. Now more than ever we need to strengthen the bonds established through the professional organizations we have joined. We need to encourage new members to join with us and add their knowledge to the pool of information we possess. Remember, our strength is in our diversity and in our numbers when we work as a team. We need to encourage our fellow members to get more involved with working on solutions to these chal-

Continued on page 5

Editor's Corner

In this issue several articles address the issue of energy. It was not that long ago that gas prices exceeding \$2 a gallon was a distinct possibility. That has not happened, yet. But that is one of the problems with energy. People only get concerned when prices are high. That, of course, makes little sense since energy is one of the big-ticket items at any plant. Some large plants are the biggest customers an electric utility has. And energy can be a significant portion of the cost to operate a plant. Any effort to reduce costs must include energy. Not only will emphasis be placed on reducing energy consumption but, depending on how your bill is structured, you also may need to be concerned with time of day usage, load shedding, peak demand, and interruptible supply. Changes in equipment to achieve more efficient operations are also an important area. Newer equipment and processes offer many opportunities to reduce energy.



Over the holidays, while up in New England, *The Rhode Island Monthly* invited reading. This publication, similar to our local *Washingtonian*, promotes our smallest state. Jobs people work was the central theme for the January 2002 issue. A large article entitled "Ordinary People, Extraordinary Jobs," had a lead piece on someone who should be near and dear to us. This person has what they call the dirtiest job, and was referred to as a sewer operator. Of course we know his job to be a wastewater plant operator. But after this labeling problem was overlooked, the piece was quite complimentary of our chosen profession. The operator worked at the large Fields Point WWTP that serves Providence. It described him as using a combination of 19th century physical labor with 21st century high tech skills. The operator, who has a business degree, says he loves what he does for a living. He calls it a great job and an important job. We could not have said it better.



Did you know that 2002 marks the centennial of the first permanent water chlorination plant? That plant in Belgium used chloride of lime and perchloride of iron. The first permanent liquid/gas chlorine use came several years later, which led to widespread use of that method of disinfection. This reminds us of Blue Plains. In the aftermath of 9/11, they decided on and implemented a change from liquid chlorine/gas to hypochlorite. Quite an undertaking for any plant let alone the region's largest plant. No more railroad tanker cars full of pressurized chlorine in our nation's capital. So it is a dose of "back to the future" at Blue Plains. Their Risk Management Planner must be breathing a sigh of relief.



Don't eat the fish. What could be worse than that for our bay waters? But that is what Maryland gave us in a fish consumption advisory issued just before Christmas. While MDE has previously issued advisories, they did not apply to popular species like rockfish, blue crabs and white perch. This new advisory recommends reduced monthly consumption of these economic and culinary bellwethers that are caught in certain tributaries to the bay. The culprits are accumulative pollutants like PCB and methylmercury. Check MDE's website for details. Since these nasties will not be going away anytime soon, one wonders how bad it will get. Will a massive removal of sediments larger than what is being planned on the Hudson River be needed? A dreadful thought. To paraphrase Janis Joplin: Oh lord won't you buy me a clean bay to fish in, My friends all eat tofu, I must make amends. 🍁



Letter To The Editor

Dear *Ecoletter*:

As I observe the direction that the Bay Program is going and read about the efforts to rebuild the oyster stocks (either with native oysters or with exotic species), it strikes me that role of the filter feeding fish (menhaden, shad, etc.) is overlooked.

These fish occupy a very important link in the Bay's ability to keep itself clean for they feed in surface waters and prevent large populations of phyto- and zooplankton from developing and thus limiting light penetration into the water. Penetration of light into the water is critical to the growth and reproduction of submerged aquatic vegetation and is one of the three parameters being proposed by the Bay Program as indicators of water quality. When filter feeders remove these organ-

isms from the surface waters, the benefits to water clarity are immediate and direct. Relying on the filtering action of oysters requires that planktonic populations die and sink to the bottom where the oysters live.

For these reasons, I again call for the menhaden fishery to be managed to increase the numbers of these important fish. They are currently in serious decline and the Bay cannot afford to be without this important link in the food chain.

Lastly, I offer the following limerick:

*"In the East, there is Chesapeake Bay,
It has too much chlorophyll a,
Said the Fed, clean it well,
Or there'll be a TMDL,
All enforced by the EPA."*

John Martin
Baltimore, MD

Presidents' Messages *(continued)*

CWEA President

—Russ Sharpe

dent-Elect, Vice-President, Treasurer and Secretary will serve on the Finance Committee. The Government Affairs Committee has continued the popular brown-bag lunch series. Vice-Chairs have been selected for several committees, in an effort to increase committee activities for CWEA members. Committee activities being planned for this Spring will be announced in the *Ecoletter* and on the CWEA-WWOA web site.

The Joint Conference Committee is planning the next Joint Conference to be held at the Clarion Hotel and Conference Center (formerly the Sheraton) in Ocean City Maryland July 9 through July 12, 2002. The Sheraton was the site for many previous Joint Conferences, although the Joint Conference has not been held there since 1997. The Clarion is currently accepting room reservations for the 2002 Joint Conference. For more information on the 2002 Joint Conference, see the CWEA-WWOA web site.

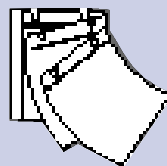
In November, Noelle Chesser resigned as the Delaware Trustee for CWEA, due to expanding job responsibilities. We are looking for a replacement for Noelle, to fill the remainder of her term of office. If you live or work in Delaware and are interested in the Delaware Trustee position, or if you know of a CWEA member who lives or works in Delaware who would be a good candidate for Delaware Trustee, please contact me at RussSharpe@MSN.COM or 301-470-3518.

If you are interested in serving on a Committee or have ideas on improving CWEA, please contact me. 🍁

WWOA President

—Bill Shreve

lenges. We need everyone's participation if we are to meet the current and future needs of our industry. I challenge each and every member to get one friend to join the association. I challenge each member to pick an area where they have some expertise, or that they are interested in and volunteer to work with others as a team to resolve some of the issues we face. I challenge employers to empower your staff by persuading them to get involved with the professional associations. I believe the pay back to your organization will be tremendous. I appreciate the employers who already have employees involved and encourage you to communicate with your peers the benefits of having a staff of professional employees. I also urge employers to communicate with the associations so we can provide support and training that meets the needs of your organization. We want to be a part of your team, a resource that you count on and an ally when you need one. God Bless America! 🍁



**Save this date
on your calendar:**

MAY 10, 2002

CSAWWA, CWEA and WWOA will hold the first Cever Tri-Association Spring Meeting. It will be held at the Dalecarlia Water Filtration Plant (located at MacArthur Boulevard at the DC/MD state line above the Potomac River, north of Georgetown). The meeting will run from 8:30-noon and registration will include a continental breakfast and lunch from Red, Hot and Blue.

Potential speakers include Harry Ways, Ben Movahed and Pam Kenel and topics include a history of the region's water system, the business of water and wastewater and TMDLs and the watershed.

For more information, contact Suzanne Russell at 410-235-1153, x.30. 🍁

ISO:
**Members for
CWEA Safety Committee.**

Interested?
**Please contact Sorin Schwartz
at 202-787-4347.**

WEF/AWWA/CWEA Joint Residuals and Biosolids Management Conference

RESIDUALS AND BIOSOLIDS MANAGEMENT—PARTNERING FOR A SAFE, SUSTAINABLE ENVIRONMENT

Held Jointly with the American Water Works Association (AWWA) and the Chesapeake Water Environment Association (CWEA)

Baltimore Marriott Waterfront Hotel
Baltimore, Maryland, USA

February 19–22, 2003

ABSTRACT SUBMITTAL DEADLINE: APRIL 19, 2002

The Water Environment Federation's Residuals and Biosolids Committee is sponsoring a specialty conference on residuals and biosolids management. One of the primary themes will focus on building public support. An example of information to be shared includes national and regional issues associated with public education, product quality and regulatory compliance. The conference will also include presentations on current and emerging technologies/methodologies used to process residuals and biosolids. The Conference Program Committee is soliciting abstracts for oral presentations, workshops, and panel discussions to be presented at the conference. Specific conference topics will include, but not be limited to, the following:

- | | |
|--|--|
| A. Regulatory and Environmental Impacts on Residuals Generation and Management | O. Biosolids/Residuals and Nutrient Management |
| B. Management of Membrane Side Streams | P. Odor Control: Issues and Answers |
| C. Co-Management of Residuals and Biosolids | Q. Enhancing Competitiveness—Doing More With Less |
| D. Research and Development Programs | R. Management of Other Organic Wastes (Animal Manures, Pulp and Paper, Food Processing, Septage, etc.) |
| E. Chesapeake Bay Regional Issues | S. National Biosolids Partnership Activities |
| F. Land Application of Biosolids and Residuals | T. International Residuals and Biosolids Management |
| G. Processing and Marketing of Biosolids: Present Day Realities and Future Challenges | U. Land Reclamation |
| H. Residuals and Biosolids Success Stories | V. Video Session |
| I. Environmental Management Systems | W. Backwash Treatment, Recycle and Management |
| J. Building Public Support and Tackling Politics | X. Direct Discharge of WTP Residuals and Other Management Options |
| K. Stabilization Technologies | Y. Effects of Lime Softening and Enhanced Coagulation on Residuals |
| L. Thickening and Dewatering Technologies | Z. WTP Residuals and the Arsenic Rule |
| M. Other Solids Processing Systems: Grit Removal, Screenings, Scum, Pretreatment Residuals | |
| N. Thermal Processing | |

Please submit abstracts for papers on the above subjects or related topics. Abstracts **must** be received no later than close of business **April 19, 2002**. Authors will be notified of acceptance of papers by early August. Authors will be expected to prepare a manuscript by October 14, 2002. In accordance with Federation policy, authors who do not submit a manuscript by that date, will be replaced on the program. Speakers will be responsible for paying their own travel expenses and registration fees for the conference. Registration fees will be approximately \$450 (advance, WEF or AWWA member rate). Submit one (1) copy of both an information sheet (*on page 7*) and a typed abstract (300–600 words, up to two pages, single spaced) to: Water Environment Federation, Technical Programs—Biosolids 2003, 601 Wythe St, Alexandria, VA, 22314-1994, USA. Fax: (703) 684-2413. **No E-mail submissions will be accepted for consideration.**

RESIDUALS AND BIOSOLIDS 2003
Baltimore, Maryland, USA
February 19-22, 2003

BIO-03 _____

ABSTRACT SUBMITTAL FORM

PLEASE PRINT NEATLY, TYPE, OR USE ELECTRONIC FORM

Copy must be received at WEF by **April 19, 2002**. Abstracts must be typed, single spaced, and fit on no more than two 8.5 x 11-inch pages. Fax submissions will be accepted but are not encouraged. Please do not duplicate mail and fax submissions. Do not send supplemental materials. An electronic copy of this form can be found on our web site (www.wef.org) under the conferences & workshops icon.

Presentation Title: _____

Keywords: _____

Corresponding Author: _____

WEF/AWWA Member ID # (if applicable,specify): _____

Company: _____

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City/State or Province/Zip/Country: _____

Phone: _____ Fax: _____

E-mail (Mandatory) _____

Coauthors: _____

Speaker Name and Address (if different from corresponding author): _____

Abstract for (select one): ? Oral Presentation / ? Workshop / ? Panel Discussion / ? Video
 Would you be willing to present your paper in a different format? ? YES / ? NO
 If YES, which format? _____

Paper submitted for session topic (indicate letter from list on page 12.): _____

Alternate session topic: _____

Will this or similar work have been submitted for consideration, presented, or published elsewhere by February 2003? ? YES / ? NO If yes, where? _____

How did you obtain this Conference Announcement and Call for Papers? ? Mail / ? E-mail /
 ? WEF Web Site / ? WEF Fax-On-Demand / ? Other, please specify: _____

MAIL:



Technical Programs—Biosolids 2003 Abstracts
Water Environment Federation
601 Wythe Street
Alexandria, VA 22314-1994

Phone: 703.684.2473

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KEY: WEB

Why Does My Facility Need an Energy Management Plan?

—Joe Guagno, P.E., C.E.M.

This is part I of a 2 part article.

Background

The Association of Energy Engineers has identified that America has three national priorities that provide a new and urgent need for saving energy. These priorities are:

- Environmental Quality (reduce global warming and reduce acid rain)
- Economic Competitiveness (reduce our cost of production, reduce industrial energy intensity and create jobs)
- Energy Security (reduce imports of oil, reduce vulnerability to oil embargo)

None of these goals can be fully attained without an energy efficient economy.

Commercial and Industrial energy use accounts for 45 percent of the CO₂ released by burning fossil fuels and 70 percent of the SO₂ emitted by stationary sources.

Energy accounts for a substantial portion of the operating costs of water and wastewater treatment and conveyance. Changes in the way we procure energy have had a significant impact on the cost of energy in recent years. As a result of utility deregulation, electric and gas utility companies around the country are forming their own energy service companies (ESCOs) to expand their market areas and win new customers.

Water and wastewater utilities that identify and understand how and where they use energy will be in the best position to identify and obtain the energy package that is the most cost effective for their organization. Developing an Energy Management Plan is the best way to identify how, when, what kind and how much energy is being used by a process or facility. In short, the more a water or wastewater utility understands about the ways it uses energy, the more control (options) the utility will have over obtaining its energy resources in the most economical way.

Energy Management Plan

An Energy Management Plan is a strategy or roadmap that identifies the ways to best procure, use and pay for energy and energy related upgrades for a (water or wastewater) utility. There are certain logical steps to be taken in developing and implementing an Energy Management Plan, they are presented below.

The First step in developing an Energy Management Plan is to identify an Energy Manager or an Energy Management Team. The energy manager must be able to

identify how the facility uses different kinds of fuels and energy. To be successful, the energy manager should have a high level of interest in the project and the process. There are several ways the energy manager can get help in developing an Energy Management Plan. For example the Association of Energy Engineers offers many seminars and training programs on various energy related topics such as conducting an energy audit, buying energy, co-generation and the like. ESCOs and many consultants have Certified Energy Managers (CEM) on staff. The Manager or Team must have support from the highest level of management. It is essential that both the Operations and Maintenance staff participate in and support the program and the Energy Manager.

The Energy Audit, Step 1— Data Collection and Analysis

The first task that must be completed by the Energy Manager is to collect the appropriate data. It is necessary to identify how energy is being used. It is also necessary to determine the cost of the energy that is being used. Once this information is available, alternatives to reduce energy use can be identified. Essentially, this is an energy audit or energy survey.

The goals of an energy audit usually include:

- To clearly identify all of the types of energy that are being used by a process or facility and to identify the costs of each of the types of energy used.
- To identify how energy is being used and to identify if any energy is being wasted
- To identify and analyze more cost-effective ways of using energy
 - Installing new, more efficient equipment
 - Improvements or revisions to operating techniques or processes
- To perform an economic analysis on those alternatives and determine which offer opportunities for savings.

There are at least two components to data collection and analysis. One component is the collection and analysis of records. Records include energy bills, drawings, equipment data sheets, operating curves and other similar information. The second component includes field investigation and evaluation—verifying that the unit exists as the records describe and indicate and the actual measurement of power flow to a unit.

The Audit should include collection and analysis of all energy bills for a process or facility. A duration of at least one year is necessary. It is preferable to use a duration of three years or more to help average out the effects of any irregularities. In order to properly analyze the energy bills

an understanding of the rate structure of each is required.

Concurrent with the collection of energy bills, record drawings (facility drawings, layout drawings, etc.) and equipment data sheets for the facility should be collected. This step may include creating sketches, if necessary, and identifying the size(s) of buildings, window types and areas, amount of insulation and the like. This step should include the creation of an inventory of major energy consuming equipment. Piping drawings and P&IDs are helpful for this task. The equipment list should include types of equipment, hours of use, time of day the equipment is used, motor horsepower and efficiency; pump and/or blower efficiency; drive type (constant speed or variable speed). If the unit is a variable speed device, the type of variable speed drive should be identified. The cost of maintenance should also be identified for the equipment.

Next, it is necessary to identify how energy is being used. To do this, identify building energy use for heating, ventilating and air conditioning. Then identify building energy use for lighting. Do this by identifying the number of light fixtures, the number, types and sizes of lamps, define the level of illumination (at work level) and use of task lighting. Finally, identify energy used by process equipment. This is the most difficult task. Most equipment in water and wastewater process and conveyance use only a fraction of the rated full load identified on the equipment data-plate. It is surprising to many that a 200 horsepower motor may never use full load power. Most new motors (medium and large size motors) will (should) be supplied with a no-load motor test report. A no-load motor report may include the power used by the motor with no load connected. It can also include measured speed, Power Factor and other performance data. It is usually necessary to measure the power being used by the equipment. This should be done several times at various operating points or conditions to capture the operating range of power use for the equipment. The data should be plotted or compared with equipment performance curves to verify that the device is performing within the manufacturers guidelines. Once collected, this data should be summarized. Spreadsheets provide an excellent format for working with the data that is collected. Data collected from a variable speed pump is shown at right.

Note the following:

At reduced speed, the system efficiency is relatively low. It is common for the efficiency of an eddy current drive and motor to drop off quickly below 90% full speed.

At full speed the eddy current drive has "locked up" as desired, resulting in good system efficiency. Although the motor is rated to produce 200 horsepower, the input power to the motor is greater than 200 horsepower (156.3 kW).

As the motor becomes less loaded the power factor drops. This facility does not pay a penalty for P.F.

For the pump noted above, the pump, drive and motor were replaced as part of an energy retrofit project.

For this project, data were taken at several points for each of 10 pumps. The operations staff provided an estimate of operating time at each different speed. The amount of time used (for each pump) was developed with the help of plant operations and maintenance staff. Run time records are helpful to identify this type of information.

The data should be collected with reliable, high quality instruments. We use a fluke model 43 power quality analyzer for capturing electrical data, a selection of test quality pressure gauges with large diameter dials, steel measuring tape (to measure wet well levels or check the accuracy of installed level monitoring instrumentation). Once data is collected, it can be analyzed and options to improve system efficiency can be identified.

Johnston Mixed Flow Pump with 200 horsepower (GE) motor and (EM) Eddy Current Drive.

Pump Identification	Pump #16
Discharge pressure	10.0 PSI
Wet Well Level	3.9 Feet
Date	April 24, 2000 @ 3:50 P.M.
Speed	750 RPM
Flow	9,600 GPM

LEG	kW	kVA	kVAR	P.F.	HZ
A1	44	57.8	37.7	.77	60
B1	41.5	56	38.1	.73	60
C1	41	53.3	32.8	.76	60
total	126.5	167.1	108.6	.75	60


Input power expressed as horsepower 170
System Efficiency (Pump, Motor and Drive) 54%

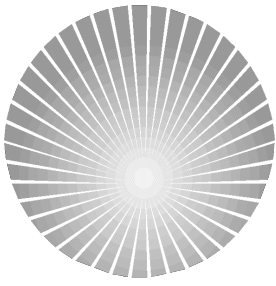
Johnston Mixed Flow Pump with 200 horsepower (GE) motor and (EM) Eddy Current Drive.

Discharge pressure	10.5 PSI
Wet Well Level	4.1 Feet
Date	April 24, 2000 @ 2:25 P.M.
Speed	850 RPM
Flow	15,450 GPM

LEG	kW	kVA	kVAR	P.F.	HZ
A1	53.5	67.8	40.4	.79	60
B1	51.2	66.1	41.3	.76	60
C1	51.6	63.5	37.1	.82	60
total	156.3	197.4	118.8	.79	60

Input power expressed as horsepower 210
System Efficiency (Pump, Motor and Drive) 72%

In the next part of this article, we plan to present how to put together an audit team, how to conduct the physical review of a facility with the audit team how to develop and identify Energy Conservation Opportunities (ECO). We will also identify unique project financing and delivery methods to implement Energy Conservation Measures (ECM). 



Energy Management— Major Challenges Ahead

—Robert Taylor
Energy Manager, WSSC

The energy industry, which is in the midst of an erratic national de-regulation process, has gone through several upheavals in the last 30 years. The oil shocks of the 1970s, heavier dependence on foreign oil, de-regulation of the gas industry in the 80s and the electrical industry in the late 90s has left consumers confused and faced with an ever increasing complexity of options. Within the last year, we have witnessed the California deregulation debacle costing tens of billions of dollars, major utility bankruptcies, the overnight collapse of one of the largest energy companies in the world—Enron—and the reality of numerous inefficiencies in the U.S. power transmission system. The water and wastewater industry already challenged with meeting ever-stricter environmental regulations and tighter security of its treatment facilities and distribution network must effectively control what used to be a fairly predictable cost of operations. In short, Energy Buying has become Energy Management.

What has been conducted by other industries (manufacturing, property management, etc.) for years is finally taking root in the water/wastewater industry. A look at recent developments:

- Advances in computer/controls technology coupled with electricity deregulation now allows users the opportunity to purchase power on a day ahead basis. Sophisticated SCADA controls systems allows treatment plant operators to adjust the operations of specific equipment to accommodate low (off peak) or high (on-peak) hourly pricing, resulting in major cost savings.
- Utilities are realizing that they are wasting a major energy source within their own treatment plants—anaerobic digesters, for example, generate a significant source of gas fuel that can be used to power gas turbine generators to supply a major source of power for the plant, and reduce the plant's consumption from their local utility or supplier.

- Due to the unreliability of some distribution systems, utilities are becoming generators themselves, utilizing hydropower, on-site peak shaving, or process off-gas as a fuel source. This is becoming an increasingly popular concept not only from a cost standpoint but security as well.
- New pumping stations are being designed and constructed with multiple pumps of smaller horsepower rather than one large pump, optimum pipe sizes, variable frequency drives, and double precision laser alignment of pumps to determine the optimum equipment configuration. Life cycle costing (incorporating partial as well as full load efficiency, power factor, etc.) is being used as a basis for bidding projects where the total life cycle cost, not only initial capital cost, is the basis for award. Studies have shown that 64% of the total life cycle cost (including the cost of construction) of a typical pumping station installation is energy.

In the late-1990s, the Washington Suburban Sanitary Commission's (WSSC) was the focus of a privatization study authorized by the State of Maryland. An independent competitive assessment that compared WSSC's then current organizational business practices with best utilities in the private sector resulted in a "competitive gap" in controllable costs of 21% between actual costs and "best in class." As a result, WSSC launched a "Competitive Action Program" to provide our customers with the best possible service at the least possible cost, without any reductions in quality, service and safety. Energy—one of the major items identified under achievable cost reductions—represented, after personnel costs, the largest cost component in the operating cost budget. A recommendation was made to institutionalize Energy Management to help optimize the use of power and natural gas in the light of a newly re-regulated market. Since that time, we have identified 7 major objectives:

- 1. Develop an effective energy usage and cost system:** "You can't manage what you can't measure" is the time-honored guideline here. A computerized system


that automatically tracks & verifies billing, usage, costs, and real-time metering/measurement of major sites/equipment is essential for a sound management program. The information must be easily available to all personnel (such as plant superintendents) who are involved with the day-to-day management of energy use and cost.

- 2. Conduct a comprehensive energy audit (with periodic updates):** All sites, processes, and energy consuming equipment must be identified and inventoried. Inefficient systems/equipment must be identified and a plan developed and implemented to upgrade and replace inefficient systems.
- 3. Develop performance metrics to show results and trends:** Management is continually evaluated on results and energy management is no different. Energy usage (kWh or BTU) per million gallons treated (sometimes referred to as wire-to-water ratio), energy cost per kWh, load factor (% of peak demand maintained) are all indications of how efficiently an organization is using and purchasing their energy supply.
- 4. Develop an effective supply strategy:** Knowing suppliers, procurement, risks, and costs all contribute to determining the right mix of gas & electric suppliers, billing options, and support decisions relating to on-site generation and alternative fuels usage.
- 5. Implement performance incentives to compensate employees for optimizing energy use.** The most efficient equipment or plan to save energy can be undermined by the inability of operations personnel to be properly trained to understand the controls sequence. Plant personnel must take ownership of any new system before it can be successful. If included in the decision process, plant operations are more apt to embrace the new technology and achieve the predicted savings.
- 6. Rethink old attitudes (and make adjustments) concerning procurement to maximize savings.** Energy

used to be considered a commodity; now it is more comparable to a service. However, as the last two years have indicated, electricity and gas supply markets have become extremely volatile. A four-hour turnaround time for approval of long-term energy supply purchases (to obtain the best pricing) is not uncommon. The time it takes for board approval of a large contract may wipe out the savings potential of a temporarily favorable market.

For design and installations of equipment and systems, Energy Performance Contracting is replacing the much longer and expensive plan, design, bid, and build method. Instead of an array of planners, consultants, engineers, and contractors, one energy service company (ESCO) provides a turnkey service and guarantees the savings over a long-term period. As a result, projects, which individually may take 10 years to plan, fund, and construction, can be completed in 2-3 years.

- 7. Extend Management and Operations Best Practices to Energy Management.** AWWARF is completing a yearlong study with input from 22 member water/wastewater utilities (including WSSC) to develop Best Practices for Energy Management. The program was member funded and included case studies from water/wastewater organizations, "Best Practices" organizations outside the industry, and extensive benchmarking to illustrate how utilities were performing against each other. In the long run, Energy Management Best Practices will become the standard against which many organizations will measure their progress.

Accomplishing all this is daunting to many organizations, but our customers and regulators are demanding that we do no less—without sacrificing quality and reliability. By looking at energy management as a tool to improve our effectiveness both in the short and long term, we can take advantage of the increasing array of choices in today's ever-changing energy market as an opportunity instead of an obstacle. 

CWEA Teams Compete at WEFTEC Operations Challenge 2001

This is the second time CWEA was represented by two teams at the National level competitions at WEFTEC. The Ocean City Tide Runners, winners at the 2001 CWEA/WWOA Joint Conference, and the DCWASA Blue Plains Special team both competed at this year's WEFTEC 2001 National Operations Challenge in Atlanta, Georgia.

Reaching the National competition as a team is what team members have in mind as they compete at the local levels. Seeing the excitement grow as each of the forty other teams from across the Nation arrives and enters the competition area is just overwhelming. Just to be there and witness this energy in every team, the event coordinators and volunteers can be overwhelming. Having seen this entire competition put together under one roof is incredible.

The people at WEFTEC really put on a show for all. The vendors, the fans and the teams spent all day on the floor observing and rooting for their favorite teams. The teams talked to each other as if they had known each other for years. They shared ideas, experiences and made new friends as the day went on.

They day started out rough for our Ocean City Tide Runners. It was becoming apparent that they had a sixth team member on the team and his name was Mr. Murphy, of Murphy's Law fame. At this year's local competition, the Tide Runners had some of the most remarkable finish times that we had ever seen. This was their second time attending a National Competition and they had several years separating them from their first.

The DCWASA Blue Plains Special team started out calm and determined. They came with experience. During the local competition, there were two new team members. However, after the local competition, one of the new team members and a veteran team member were injured. The Special used their alternate and convinced a past team member to come out of retirement and compete at WEFTEC.

Ops challengers working on a pump.




By the end of the day, there were many tired people. Some teams had very high hopes and many showed signs of disappointment after having competed. However, the one thing for sure was a lot of bonding took place and each team produced many friends and fans.

There were two Divisions of teams for the Operations Challenge. Thirteen teams were in Division #1 and twenty-four teams in Division #2. Both of the CWEA teams competed in Division #2.

The Ocean City Tide Runners finished in 17th place with their best finishes in the Collections and Maintenance Events with a 5th and 7th place respectively. The DCWASA Blue Plains Special team finished 3rd. For the second year, the Blue Plains Special placed 1st in the Safety event at the National level. They also placed 2nd in the Collections and 7th in the Laboratory events.

The CWEA is very proud of our teams' accomplishments. We congratulate both teams and their team members for their hard work

and dedication. They are truly professional operators who can share the many success stories they have experienced and who stand out as future leaders in the Wastewater Operator field.

If you are interested in finding out more information about the Operations Challenge or would like to enter a team into this year's 2002 Annual CWEA/WWOA Joint Conference Operations Challenge Competition, please contact Wayne Reed at wreed@dcwasa.com or 202-787-2068. 

CITY OF HAGERSTOWN Water Pollution Control Department Manager

The City of Hagerstown, Maryland is seeking an energetic and skilled individual to join our Managerial staff in the key position of Water Pollution Control Department Manager. This position reports to the City Administrator, directing the overall operation of the City's sewage collection and treatment systems. The position oversees all phases of sewage system design and construction. Evaluates, recommends, and administers contracts and professional service agreements. Approves the purchase of materials and equipment. Establishes departmental policies, procedures and methods of the regulation and operation of the collection and treatment systems. This position oversees a departmental operating budget of \$7.1 million and capital projects budget of \$6.6 million in the current year with a full-time staff of 42.

Position requires a minimum of 7 years experience in the operation of wastewater collection and treatment systems. A Bachelor's degree required with course work in engineering, business or related science. Applicants should be able to obtain a Maryland State Waste Water Operations Class 5, Advanced (A), Superintendent Certification, within 5 years. Related work experience may be substituted for educational requirements and 4 years minimum experience in a supervisory capacity is also required. Salary range \$57, 704-\$70, 553 plus excellent benefits package.

Applications or resumes may be received at the Human Resources Department, 1 East Franklin Street, Hagerstown, MD., 21740 phone 301-739-8577, Ext. 108. Completed applications or resumes must be received by 4:30 P.M., March 15, 2002 or you may email your resume to www.hagerstownmd.org. Candidates requiring special assistance should contact Human Resources at the above number. The City is an Equal Opportunity Employer.

A Salute to Our Sponsors

Many sponsors and friends make the local levels of competition possible. The volunteers who set up these competitions and help organize the support and funding for the Operations Challenge are greatly appreciated. Without our Sponsors' financial support, time provided to help train our team members, the loan of tools and equipment, and personal time donated, these competitions would be very costly and the CWEA would have never been able to support this program.

The CWEA, the Volunteers and the local Team Members all wish to thank you for the continued support you and your companies have provided over the years.

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The State of the Wastewater Utility Industry— A Reflective Glance Back, and a Purposeful Look Ahead ("9 in 10")

Alan W. Manning, Chairman of the Board, EMA, Inc.

The following article is based on Mr. Manning's presentation at the pre-conference session at our 2001 conference on the future of utility management.

INTRODUCTION

The wastewater utility industry deserves a pat on the back. Since the threat of privatization became a force to reckon with a decade ago, many of you have stepped up to the plate, improving your overall productivity. But as we head into the new century, we must ask ourselves some new questions—learning from the past but leading to the future.

What have we learned from the last 10 years of competition? How can we use this knowledge to position our wastewater utilities for the next 10 years? And what megatrends will require our action as the millennium begins to wake up?

Let's take a quick tour of the impacts of competition—past and present—and then take a more detailed look at things to come. "9 in 10" is our prediction of nine megatrends that will directly and significantly impact wastewater utilities in the next 10 years.

Setting the Context

The wastewater industry, as we know it today, is relatively young in terms of longevity and maturity. Environmental legislation in the early 1970s began a dramatic change in the level of sophistication of wastewater treatment processes. The "new" industry operated on a safe and solid base—but kept many of its costly monopolistic practices.

In the mid-1980s, Great Britain hoisted the privatization flag. In a few short years, the invasion landed in North America, with the industry facing its first real competition from the British and French in the early '90s. Since then, we've all read headlines about the private sector winning over public utilities—but what about public sector progress? Many public utilities have responded to the private sector challenge, and have made significant progress over the last 10 years.

Progress Toward Getting Competitive

In the early 1990s, the state of utility productivity showed an average gap of 35 percent between public utilities and industry leaders.

But by the dawn of the new millennium, productivity in the public sector increased drastically, now show-

ing an average gap of 22 percent, an improvement of more than one-third in 10 years. Overall productivity, operations productivity, and maintenance productivity have improved. The major reasons for these improvements come from:

1. Utilities being able to change their culture, dismantle their hierarchy, and work teams
2. Utilities analyzing their work practices and making substantial improvements in those practices to improve productivity
3. Utilities focusing on using technology and e-Commerce as a strategy to improve productivity and enhance customer care and satisfaction, all while improving revenues

Today's utilities fall into four categories—from being well run and efficient, to being poorly run and inefficient. The reality is that as many as one-fourth of today's public utilities will be privately managed within 10 years because they were unable to change quickly enough to become competitive and maintain their independence.

"9 in 10" the Megatrends

So what's in store for the future? We have identified nine specific megatrends spanning the next 10 years in the waste-water industry, trends that we must watch as indicators of change. These flow from one to the next, each creating or contributing to the next. These megatrends are listed, not in order of priority, but in the form of a storyline that threads itself through our future.

The storyline starts with the *expanding regulations* that will lead to greater demand for *reclamation and reuse* due to limited resources. This will result in the need for more extensive *infrastructure*, causing *finance* to rear its ugly head. To minimize the inevitable and significant *rate hikes* that will be needed to pay for this new infrastructure, even greater demands will be placed on managers for improved *efficiency and performance*, coupled with increased use of *automation and technology*. The *new workforce* will have to be continually retrained to handle new technology and processes. All these changes and challenges present the wastewater utility industry with a great marketing *opportunity*.

MEGATREND #1 Regulations Will Proliferate

Massive regulations for combined sewer and stormwater overflow are evolving and will cause signifi-

cant challenges for authorities and municipalities. The challenge of biosolids disposal will not go away. Definitions of Class A and Class B sludges will continue to change and evolve again, which puts pressure on the municipality or authority to increase levels of treatment.

Effluent limits will continue to get tighter and tighter as the regulatory agencies push for reclamation and reuse. These changes, along with the many other changes that are taking place in the wastewater industry, are driven by the regulations.

MEGATREND #2 Reclamation and Reuse Will be Mandated to Conserve Water Resources

The real issue driving the use of reclamation and reuse is the distinct possibility that we will run out of a limited and valuable resource. This is already occurring in the dry Western states. New laws are being passed to divvy up the water in the Colorado River, which is going to limit the water flows to Los Angeles and San Diego, and potentially to San Francisco, Phoenix, and Tucson. Within the next 10 years, reclamation and reuse will be commonplace throughout the country, again driven by the need to supplement raw water sources. Water will become extremely valuable, and water rights trading will expand with wastewater reclamation and reuse. Water rights will become analogous to oil rights in value because of the limited quantity and the importance of the resource. Along with the reclamation mandate will come a water conservation mandate to further supplement scarce water quality resources. Within the next 10 years, every wastewater utility will be required to have a water reuse and water reclamation plan in place, showing how it will generate the capital budget needed to make this happen.

MEGATREND #3 Consumers Will Dictate New Directions

As resources are depleted, public involvement will become more prevalent. Consumer attitudes will control to what extent reclamation or reuse can happen. Public trust and confidence in wastewater utilities peaked in the 1970s when many of the secondary plants were built. Since that time, however, trust and confidence have decreased overall due to recent disease outbreaks, which linger in customers' minds.

Many customers do not separate water and wastewater treatment in their way of thinking, so when there is an outbreak of disease, they don't have a clear understanding of the cause—they only have fear of all things water. Numerous studies have shown increasing consumer concerns about quality; bottled water sales continue to rise. The EPA-required consumer confidence reports have had a dual effect—on the one hand, consumers are happy to see that the information is being reported; on the other hand, it indicates concern about whether or not the quality is adequate.

Consumer attitudes—and our ability as an industry

to develop appropriate public relations efforts—will dictate whether or not reclamation and reuse will be viable.

MEGATREND #4 Infrastructure Needs Will Be Enormous

As a result of increasing regulations, continued growth in our communities, and the evolution of consumer attitudes in terms of trust and confidence, we are facing a tremendous need for infrastructure investment. We have aging facilities in need of repair, while we also have growing populations that strain existing system capacities. Expansion and extended treatment facilities will be extremely capital intensive. The estimates for capital expenditures are staggering, and the coalitions within the industry highlight infrastructure needs on a continual basis. Drainage management and watershed management are also becoming more critical, and the required infrastructure investments are extremely large as a result.

MEGATREND #5 Financial Crisis Looming Due to Investment Required for Infrastructure

Huge capital investments needed over the next 10 years will result in a financial crisis for wastewater utilities. The industry in general has been avoiding this crisis by refusing to increase rates, sometimes putting off investment in infrastructure. Most public agencies are not investing at a rate that will replace the infrastructure before it fails. When you add the growth and regulation factors to this, you see tremendous finance needs—making it clear that a major physical crisis is looming. It's inevitable—rates will drastically increase. The ratepayer needs to be made aware of these requirements to be prepared for the hike. Since it is unlikely that federal or state funding are forthcoming, the rate increases are inevitable. There are, however, several ways in which wastewater utilities can moderate these rate increases: improved efficiency and performance, automation and technology, and workforce productivity.

MEGATREND #6 Efficiency Will Drastically Improve

Efficiency and improved performance is a must. Because of the massive need for infrastructure investment and the subsequent tremendous increase in rates, the public will demand that either the agencies be privatized to improve efficiency or that they change, moving away from the monopoly mindset to becoming an efficient business. The average public utility has a 22 percent competitive gap as opposed to the private sector. This means the private sector potentially will operate, maintain, and administer a public utility at 22 percent less than the public agency can do it.

The driving force here is: can public agencies that operate as monopolies change their behavior to become efficient, business-driven agencies? Many have already made great strides, but an even greater effort will be needed. The alternative to change is allowing the pri-

vate sector in, and having them make the agency efficient. This megatrend for improved efficiency and performance by either public or private means is very real. Within the next 10 years, every wastewater agency will be operated as an efficient business-driven enterprise—either from within or from without.

MEGATREND #7 Technology Will See Even More Rapid Expansion

One of the major tools to make efficiency a reality in the wastewater utility industry is through the use of automation and technology. In public wastewater facilities today, typically only 50 percent of the automation or information systems are being effectively utilized. In many cases, the automatic portion is turned off because operators and managers do not believe it will work. Within a private sector operation, however, you will see 100 percent of the automation being utilized to improve productivity. As an industry, we will see a tremendous increase in the effective use of automation and technology. Public agencies must overcome the problems with automation and technology in order to get the efficiencies and performance necessary. This means that the business case for the use of technology and automation must be made prior to any project, and that business case must be proven in every instance. The results must be produced and proven. It is clear that e-Commerce will affect us in every way—how we buy supplies or sell solid waste, how we pay bills and receive payment for our services. The most important results of e-Commerce will be significant savings for you and improved service for your customers. Communication with your customers will be an increasing challenge, but with great potential. Over the next 10 years, the industry will see a tremendous investment in automation and technology. This poses many challenges on the human side, in that the workforce must be ready for this tremendous evolution.

MEGATREND #8 Workforce Development Will Be More Vital Than Ever

The workforce is changing, but must change even more rapidly over the next 10 years. The diversity of workers is the only way we can meet the workforce demands of the next 10 years. Workforce flexibility is essential, and all managers, supervisors, and employees in the industry must receive a diversity of education in order to ensure a smooth transition. New technical skills must be learned in order to use the technology and automation that is necessary to be efficient and productive. A tremendous investment in training will be needed to get the workforce ready for the new ways. Efficiency and improved performance come from new ways of working together—new work practices and the application of technology. Thus, training programs (not just training classes), training centers, and training insti-

tutes will be necessary within (or available to) every agency to ensure that the behaviors are changed permanently, and that the diverse workforce is ready and trained to use the new methods.

MEGATREND #9 Market Opportunities Will Abound

Over the next 10 years, we will face tremendous needs in the wastewater utility industry—the need for infrastructure expansion and replacement, the need for funding to pay for those capital improvements, and the need to have smaller treatment facilities “integrated” with larger regional facilities so that the resources can be shared. Opportunities will abound for creativity and collaboration.

A key to taking advantage of this great market opportunity lies in consumer attitudes—the consumer will control the which way the industry evolves.

The whole idea of globalization with multinational and international firms providing resources, the whole concept of design/build as a method to cut costs and increase the speed at which these facilities are built, are all tremendous demands in our market for resources, creative engineering, and technical applications.

All in all, the industry is positioned to receive tremendous attention over the next decade. There are huge opportunities for those who are strong enough to take them on.

Get ready for “9 in 10”

So that’s the story—an advance copy of “History of the Wastewater Utility Industry 2000–2010” which won’t be in your bookstores for about 10 years or so. We either are, or soon will be, facing the “9 in 10” megatrends. We need to position ourselves now, so that we will be prepared to manage them when they arrive.

More regulations mean that reclamation/re-use will be mandated, a delicate issue with customers. New and improved facilities will be required, creating financial crises for many utilities. Wastewater utilities can minimize the inevitable rate hikes through improved efficiency and performance, use of automation and technology, and creation of a new “smart” workforce. It makes no difference how big or small your organization is—all wastewater utilities will face these same issues “sooner and later.” So view the future as a disaster or an opportunity. Do nothing, and you will face disaster. But anticipate these megatrends, plan, and prepare strategies to deal with each of them, and you will come out a winner—a more productive and creative organization.

Charles Darwin’s statement was never truer than it will be in the next 10 years: *It is not the strongest of the species that survive, nor the most intelligent, but the one most responsive to change.* 🍁

Comparison of Calculation Methods for the Extended Aeration Bench Test

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Greg Kester,
Wisconsin Department of Natural Resources
State Residuals Coordinator

Background

Pathogens in sewage sludge pose a disease risk only if there are routes by which the pathogens are brought into contact with humans or animals. A principal route for transport of pathogens is vector transmission. Vectors are any living organisms capable of transmitting a pathogen to another organism. Vectors for sewage sludge pathogens include insects, rodents, and birds. For biosolids applied to the land, assuring the characteristics of sewage sludge do not attract vectors provides protection against transmission of pathogens by vectors. Attractiveness of biosolids to vectors can be reduced in various ways. One way to reduce vector attraction is to reduce the sludge food value and odor by long digestion. Federal sludge regulations specified in 40 CFR part 503, and chapter NR 204 Wis. Adm. Code, provide 10 alternatives for demonstrating vector attraction reduction in biosolids. Historically (e.g., "Criteria for Classification of Solids Waste Disposal Facilities and Practices"—1979, and WPCF Manual of Practice No. 8—1967) sludge stability has been demonstrated by reducing volatile solids by 38% across a digestion process. Reducing volatile solids by 38% has been established as the standard to demonstrate adequate vector attraction reduction.

In activated sludge processes that operate in the extended aeration mode, sludge entering an aerobic digester or storage structure has already been partially digested so it is difficult to achieve an additional 38% volatile solids reduction. Alternative methods for establishing adequate vector attraction reduction are appropriate and accepted in these instances. The alternative methods for aerobic sludges are as follows:

- Reduction in specific oxygen uptake rate (SOUR) to 1.5 mg O₂/hr/gm TS.
- Less than 15% additional volatile solids reduction during a subsequent bench-scale aerobic digester operated for 30 days at 20 C.

Each of these criteria are characteristic of a stable biosolid and indicate a biosolids with little food value to attract vectors. Farrell, Bhide, and Smith (Development of EPA's New Methods to Quantify Vector Attraction Reduction of Wastewater Sludges, 1996) have shown that the additional volatile solids reduction that occurs when sludge is batch digested aerobically for 30 days correlates well with the SOUR values.



Figure 1—Bench-Scale Aerobic Digestion Test Apparatus

Methods for Calculating Percent Volatile Solids Reduction

EPA has prepared a guidance document that includes procedures for performing the bench scale extended aeration bench test (Environmental Regulations and Technology, Control of Pathogens and Vector Attraction in Sewage Sludge—1999). This document, also referred to as the "White House" document because of the cover photo, includes the test procedure and also the method of calculating the percent volatile solids destruction achieved during the test.

There has been some misunderstanding of the proper method of calculating percent volatile solids reduction
continued on page 18

during the aerobic bench test. This has, on occasion, resulted in a misrepresentation of vector attraction reduction. Either the Van Kleeck formula or the mass balance formula can be used to calculate the percent volatile solids reduction during the aerobic bench test. When developing the standard of less than 15% additional volatile solids reduction, EPA used the Van Kleeck formula due to its simplicity and lower variability when compared with the mass balance approach. The method of determining the volatile solids (VS) reduction during the bench test on a mass basis is as follows:

% Volatile Solids Reduction (%VSR) equals:

$$\left[\frac{\text{Mass VS at start} - \text{Mass VS at End}}{\text{Mass VS at start}} \right] * 100$$

The Van Kleeck Equation is a simplification of the mass balance equation where it is assumed there is no change in the amount of fixed solids during digestion. This often leads to an under estimation of the percent volatile solids reduction since some fixed solids are reduced during digestion. In a full scale system where demonstrating at least 38% volatile solids reduction; this under estimation is conservative. However, during the aerobic bench test, an under estimation of volatile solids reduction could result in less than 15% volatile solids reduction when in fact the volatile solids reduction exceeded 15%. Nevertheless, the Van Kleeck is still acceptable for this determination because it was the basis on which the standard was developed. The form of the Van Kleeck Equation is as follows:

Percent Volatile Solids Reduction (%VSR) equals:

$$\left\{ \frac{(\%VS_{in} - \%VS_{out})}{[\%VS_{in} - (\%VS_{out} * \%VS_{out})]} \right\} * 100$$
 (%VS is the volatile fraction of the total solids.)

The Van Kleeck Equation is widely used since it only requires the percent volatile solids concentration of the feed solids and the final solids to calculate the percent volatile solids reduction. There is no need to know flow rates or total solids concentration.

In some published information, it is not clear that the mass of volatile solids should be used in the mass balance equation instead of the percent volatile solids. Many operators and chemists use the percent volatile solids since they are familiar with calculating percent volatile solids reduction using the Van Kleeck Equation. Three examples of calculating the percent volatile solids reduction for the aerobic bench test are provided below. The 3 methods include using the mass balance method,

the Van Kleeck Equation, and an incorrect third method which considers using the percent volatile solids in the mass balance equation.

Example Calculations

Suppose we run an extended aeration bench test on an aerobic sludge and obtain the following results:

Volume of bench reactor
 10 gallons
 Starting total solids concentration
 1.60% (equals 16,000 mg/l)
 Starting percent volatile solids concentration
 70%

Ending total solids concentration
 1.32% (equals 13,320 mg/l)
 Ending percent volatile solids concentration
 67%

Mass of total solids at start of test: = 16,000 mgTS/l *
 10 gallons * 8.34 lb/(mg/l)/1,000,000 gal = 1.33 lb TS

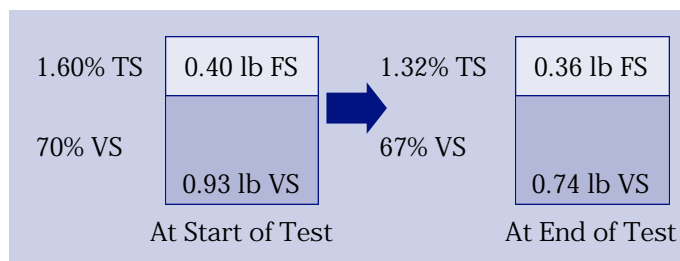
Mass of volatile solids at start of test:
 = 16,000 mgTS/l * 0.70VS * 10 gallons *
 8.34 lb/(mg/l)/1,000,000gal = 0.93 lb VS

Mass of fixed solids at start of test:
 = 16,000 mgTS/l * (1 - 0.70 VS) * 10 gallons *
 8.34 lb/(mg/l)/1,000,000gal = 0.40 lb FS

Mass of total solids at end of test:
 = 13,200 mgTS/l * 10 gallons *
 8.34 lb/(mg/l)/1,000,000gal = 1.10 lb TS

Mass of volatile solids at end of test
 = 13,200 mgTS/l * 0.67 VS * 10 gallons *
 8.34 lb/(mg/l)/1,000,000gal = 0.74 lb VS

Mass of fixed solids at end of test:
 = 13,200 mgTS/l * (1 - 0.67 VS) * 10 gallons *
 8.34 lb/(mg/l)/1,000,000gal = 0.36 lb FS



Calculation of Percent Volatile Solids Reduction using Mass Balance Method

$$\begin{aligned} \text{Percent Volatile Solids Reduction (\%VSR)} &= \\ (\text{lbVS}_{\text{in}} - \text{lbVS}_{\text{out}}) \div (\text{lb VS}_{\text{in}}) &= \\ (0.93 \text{ lb} - 0.74 \text{ lb}) \div (0.93 \text{ lb}) &= 20\% \text{ VSR} \end{aligned}$$

Using the mass balance method, the sludge would not pass the vector attraction reduction requirement since the percent volatile solids reduction is greater than 15%.

Calculation of Percent Volatile Solids Reduction using Van Kleeck Equation

$$\begin{aligned} \text{Percent Volatile Solids Reduction (\%VSR)} &= \\ (\%VS_{\text{in}} - \%VS_{\text{out}}) \div [\%VS_{\text{in}} - (\%VS_{\text{out}} * \%VS_{\text{out}})] &= \\ (0.70 - 0.67) \div [0.70 - (0.67 * 0.70)] &= 14\% \text{ VSR} \end{aligned}$$

Using the Van Kleeck equation, the sludge would pass the vector attraction reduction requirement since the percent volatile solids reduction is less than 15%. The difference between the mass balance equation and the Van Kleeck equation lies in the fact that, for this example, there was a reduction in fixed solids during the test. The plant can still use this under estimation to represent the sludge as passing the vector attraction reduction requirements since the Van Kleeck formula

calculates volatile solids reduction less than 15%. Again it should be noted that this equation is acceptable because it was the basis for the standard. Future revisions to the federal regulation may increase the standard and require use of the mass balance equation, but this calculation is acceptable until that time.

Calculation of Percent Volatile Solids Reduction using %VS in Mass Balance (Approximate Mass Balance Equation—Incorrect Method)

$$\begin{aligned} \text{Percent Volatile Solids Reduction (\%VSR)} &= \\ [(0.70 - 0.67) \div 0.70] * 100 &= 4\% \end{aligned}$$

Using this method, the plant operator would incorrectly under estimate the volatile solids reduction during the bench test. In this example, both the Van Kleeck and this Approximate Mass Balance equation resulted in values which were less than 15%. The Approximate Mass Balance equation will always yield much lower results and is not an acceptable equation to use for this demonstration. It is very possible to have test results which would fail the criteria using either the Mass Balance or Van Kleeck equations but would appear to pass using the Approximate Mass Balance equation. 🍁

Land Treatment of Grease Trap Wastes

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response to GTW application.

Well into the field research, another evaluation parameter was realized, Total Volatile Solids (TVS). This



The roots, stem and leaves of the soy bean plant on the left demonstrate the benefit of GTW amendment into the sandy clay loam soil at the research site.

parameter was easily obtained using inexpensive equipment and a 24-hour time span. TVS also accounts for the fatty and non-fatty GTW component (which at times can equal the fat content). This realization resulted in a more realistic carbon loading figure with which to base the field loading calculations. This analysis was ultimately used to establish GTW and other fatty material loading rates on a dry weight basis.

Other aspects of the research included the evalua-

tion of germination in plots and fields amended with GTW and other fatty waste; drought resistance enhancement; effects when mixed with septage; effects when injected under a hay crop; the effect of an environmentally friendly emulsifier on surface applied GTW; and the effect of seasonal application on the same plot.

The study results demonstrate that there are no negative effects, even at levels as high as 4 tons of material per acre, when sufficient nutrient is available for fat consuming microbes. The methodology for a land based treatment protocol for GTW now exists and can easily be implemented. There is evidence, measured by an increase in soil organic content, that the land treatment of GTW and other fatty waste enhances soil that is used for crop production. This practice can be incorporated into conventional farming.

¹ (Plante, Alain F., "Biodegradation of Land Applied Oily Food Waste and Associated Changes in Soil Structural Properties", 1996, The University of Guelph, Ontario, Canada) 🍁

Land Treatment of Grease Trap Wastes

A Beneficial Approach

—Stephen P. Rohm, Environmental Scientist, DNREC

Grease trap waste (GTW) is the contents of a tank designed for the separation of solid and liquid greasy waste from the wastewater discharge of a commercial food preparer or restaurant. The grease trap is designed to separate as much greasy waste as possible prior to displacement of wastewater to a central sewer system or septic system. In most modern installations, the grease trap handles only kitchen wastewater without sanitary wastewater contamination. The design of the grease trap allows it to accumulate much more than grease and water. It also accumulates food scraps and trash from garbage disposals, food material and fried food coating from dishwashing, and other material that makes its way to the kitchen drain. Sampling a grease trap yields a watery mass containing non-greasy material almost in equal proportion to the grease it was designed to retain. There is also a healthy population of decomposition microbes adding to the matrix and giving it a distinctive odor.

Disposal of GTW due to its odorous, watery nature poses a problem to local regulatory agencies, hauling contractors and restaurant owners. Several methods are currently used in handling GTW. Rendering, processing at facilities designed for treating GTW, discharging to wastewater treatment plants and land treatment. Rendering and land treatment are by far the most economical, but rendering facilities are not always available or willing to accept this inferior material. Land treatment seems to make the most economic sense for disposing of GTW—but has its drawbacks. Viewing land treatment as a disposal methodology gives GTW the stigma of being a waste. Different regions of the U.S., for a variety of reasons, ban land treatment of GTW.

None of the above handling methods seem to offer an economically or regulatory sound solution for GTW disposal. However, demonstrating the use of GTW as a beneficial soil amendment could change the negative perception of land treating GTW.

Limited research is available on GTW as a beneficial

soil amendment. The information that is available indicates that, if properly managed, GTW and other fatty wastes can benefit not only the organic content in soil but can preserve and restore soil textural properties (Plante, 1996)¹.

The primary purpose for researching the possible beneficial properties from land applying GTW is to establish a protocol that yields beneficial results. Additionally, the research can yield a sensible approach to regulating or standardizing the activity. Concerns about potential pathogenic organisms, heavy metals and nutrient loading have to be addressed in touting the beneficial aspects.

Field research was conducted in central Delaware (1996–1998) to establish protocol and explore the effect of GTW application to cropland in a variety of methods. To assure compliance with existing state regulations, the sites used for the research were already lands approved for the application of biosolids. Using these lands and additional guidelines from Federal and State regulations,

the research proceeded. The research examined the actual field responses to surface and subsurface application of GTW and related fatty material. Of primary concern was the volume and condition of the GTW and the ensuing crop response to the application. Due to cost factors and difficulty in analyzing the material for the desired parameters, minimal laboratory analysis was performed. Much of the analytical information nec-



Surface application (1), followed by incorporation (2) and fertilization, prepare the soil for the crop (3).



essary for characterizing the waste and establishing loading rates was gleaned from literature research.

Activity such as cultural practices and observable effects were documented. Except for direct application over a hay crop, there were no observable negative effects from the volumes applied. Standard agricultural soil analyses were performed to measure changes in soil organic content prior to and after application. Other parameters were either measured or observed to establish whether or not there was really a beneficial

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Public Acceptance of Biosolids

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www.biosolids.org

—By Sam Hadeed,
NBP Technical Communications Director, WEF

The National Biosolids Partnership's (NEP) environmental management system (EMS) for biosolids is designed to assist wastewater agencies implement biosolids management practices that build public confidence and go beyond mandatory regulatory requirements. The EMS program will also help program participants demonstrate to their communities that they are committed to improving environmental performance. Please visit the **EMS Guidance** section of the NBP web site to learn more about the program (www.biosolids.org).

Various barometers may be used to measure whether or not a biosolids program is following good management practices. One is technical, focusing on equipment performance (i.e. the mechanical infrastructure) needed to run a good program. Others revolve around personnel, regulatory compliance, and overall program logistics (i.e. coordinating all program elements).

But one of the most critical, and most often overlooked, barometers is **public acceptance** of the biosolids management program. Building in the infrastructure to gain and maintain public acceptance is just as crucial as having all the screens, dewatering presses, field equipment and other mechanical components necessary to treat wastewater and manage the solids. Too often, however, public acceptance doesn't enter the picture until there is a problem with the biosolids management program.

Public acceptance is an integral component of good biosolids management practices. It is perhaps one of the most important considerations of any biosolids management program, especially if land application is selected as a management method. At the core of this mindset is putting public acceptance issues and strategies at the same level of importance as other elements of a biosolids management program. This means that throughout the decision-making and design processes, impacts on public acceptance must be addressed.

Typically, the need for public acceptance is most directly associated with beneficial use (land application) programs. Beneficial use programs often put biosolids into the public arena more broadly than incineration or disposal, since the biosolids are used in more diverse geographic areas. However, any biosolids management method must consider issues such as truck traffic and air quality/odors, both of which affect public

acceptance. More importantly, addressing public acceptance from day one goes a long way toward building flexibility into a biosolids program because managers have laid the groundwork—the infrastructure—for gaining public support.

The issues that need to be considered in developing an effective public acceptance strategy include:

- Shaping public perception
- Analyzing Operations
- Dealing with odors
- Developing effective communication
- Environmental Management System Connection
- Message Development
- Maintaining Support

Shaping Public Perception

The public's perception of biosolids can make or break any management program, no matter how well it is run. Biosolids managers should take advantage of every avenue and opportunity to have a positive impact on that perception.

The foundation for that effort is a well-run operation, one that has a basic commitment to avoid negative impacts on the community and the environment. A well-run program provides the foundation upon which public support can be built. It gives you the confidence to go out to your community and emphasize the benefits of your program to win public support.

To succeed in community outreach, everyone involved in the biosolids program must understand and believe steadfastly in its benefits, and convey them to the public. Two important categories are environmental and community benefits.

Environmental Benefits

Connecting wastewater treatment (and therefore biosolids) to the goal of clean water is a fundamental message to take to communities. Wastewater treatment is specifically designed to prevent negative environmental and public health impacts, and managing biosolids from that treatment should be understood in the same context. The link with clean water is a significant community benefit that people can relate to. Issues surrounding biosolids management (including potential odor and nuisances) are more readily resolved if communities appreciate why we produce biosolids in the first place.

As part of the clean water message, the public needs to understand the role of industrial pretreatment in the wastewater treatment process. The pretreatment program directly determines biosolids quality and is not well understood by the general public or sometimes by biosolids managers. Public outreach should include specific information about the requirements and implementation/enforcement of the local pretreatment program. The basic principle of pollution prevention is at the heart of industrial pretreatment. Industry has learned, especially over the past 15 to 20 years, that it makes good business sense to minimize the amount of pollutants that go out of their pipe by recapturing and recycling them within the industrial process. Capital investments in industrial recycling processes provide an excellent return on investment to companies, and have gone a long way to improving biosolids quality. Industrial pretreatment practices and household hazardous waste programs should be showcased as part of the biosolids quality assurance program.


Land application programs should highlight the beneficial impacts that result from biosolids use. For example, biosolids provide nutrients and valuable organic matter to improve soils. They can play a critical role in remediating contaminated or disturbed sites that are eyesores in the community.

Community Benefits

Wastewater treatment and thus biosolids management are a critical component of any economic development effort. Wastewater treatment enables residential

and industrial growth. It is important that the public understand that connection, especially if industries are providing jobs to a community. Biosolids managers also need to have the mindset that a well-run biosolids program can benefit the community just as a solid waste recycling program does. The public has been educated about the importance of recycling, and most citizens willingly take on the responsibility to participate in programs. Unfortunately, wastewater treatment is usually an out-of-sight, out-of-mind infrastructure, an "assumed" service. Often, the public's only connection to that service is flushing the toilet and sending the dish or bath water down the drain. Building a positive perception for biosolids requires that a connection be made to this assumed service, that biosolids result from this process and must be managed, just as the trash a household generates must be managed.

Communities located at a distance from the treatment plant also need to be part of a facility's outreach program. Agricultural application, in particular, often operates in different communities at varying distances from the treatment facility and in different political jurisdictions. Outreach efforts should be designed to be flexible enough to work in various settings—from rural agricultural to rapidly developing suburban areas. Biosolids managers will need to become familiar with these diverse communities, and remain flexible enough to establish rapport with all of them to maintain a successful land application program.

Reference: NBP Manual of Good Practice (2001)—Chapter 1 

Nominations for the Collection Systems Award

The Collection System Award is presented to an individual for contributions to the advancement of the state of the art of wastewater collection. The award consists of a plaque suitably inscribed with the recipient's name.

Criteria:

- I. Must be a member of CWEA and WEF.
- II. Documentation and supporting information on the contribution.
- III. The nominee's area of service can be in any of the following areas: management, overall planning, facility design, education, training, or research.

If interested, please contact John Trypus, Collection Systems Committee Chair, at 301-362-5285 or John_Trypus@metcalfeddy.com for submittal instructions.

Thanks for your interest and support of this important award.

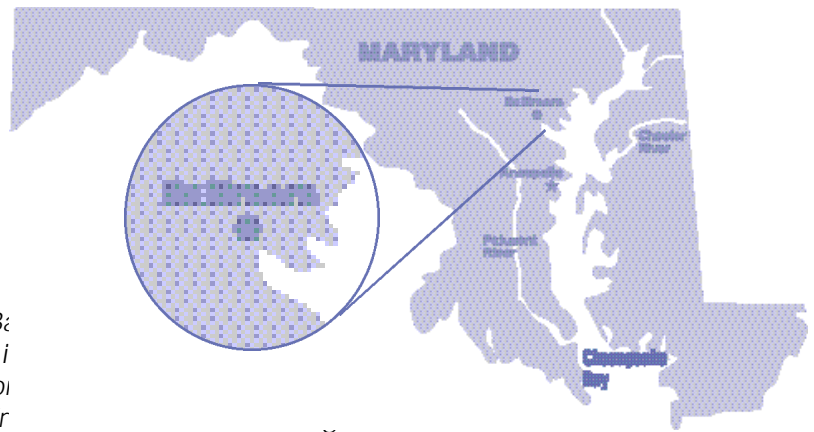
Composting in Baltimore

—By Tracie Reynolds,
Northeast MD Waste Disposal Authority

Since the time of its inauspicious beginnings, The Baltimore City Composting Facility has been shoehorned in nine acres of land between the City of Baltimore's Hawkins Point Landfill and a drywall manufacturer. From this cozy site, the compost facility has accepted and processed well over 600,000 wet tons of biosolids and produced and distributed nearly three quarters of one million cubic yards of compost. Over the last 13 years, the facility has overcome management and operational issues, and corrected high production costs coupled with low product quality to become a model facility in the industry of biosolids composting. USFilter Operating Services, Inc., now owns, operates, maintains and manages the Compost Facility and markets and distributes the compost product. Operation efficiency at the Baltimore City Compost Facility is at an all time high while achieving some of the lowest costs in its history—and the facility has consistently sold out of its high quality compost product since 1997. This unique partnership between the City of Baltimore and USFilter has weathered several storms, and emerged stronger for the experience.

The Baltimore City Composting Facility was built in 1987 and officially began commercial operations in March of 1988. Construction was financed with tax-exempt bonds issued by the Northeast Maryland Waste Disposal Authority, a non-profit member organization whose mandate is the development of regional waste disposal programs including recycling and beneficial use facilities. Service agreements were established between the Composting Facility and the City of Baltimore for the acceptance and processing of its biosolids. This was the first facility constructed for the City to process biosolids and produce a Class A, Exceptional Quality, product for beneficial reuse. Today, the City of Baltimore has established a diversified biosolids management program that utilizes two Class A technologies—composting and thermal drying—and a Class B, land application operation.

Shortly after its commissioning, the facility fell victim to a period of unreliable operation and the production of a low quality product. In 1996, the compost facility hit its lowest point as it was plagued with high operations and maintenance costs in addition to turning out a product that offered little market value and generated minimal market demand. USFilter Operating Services and the current staff became involved and took



it and product marketing. Responding quickly, USFilter invested in and implemented a Process Improvement Plan and Marketing Plan that continue to be the cornerstone of the technical and financial success of the 2001 US Filter, Operational Excellence Award winning facility today.

The most notable improvement was a modification made to the in-feed compost mix, resulting in significantly enhanced, finished product quality. USFilter eliminated the use of fresh wood chips and began utilizing a mix consisting of double ground, kiln dried pallet wood, sawdust, and high carbon ash as amendments. This change maximized the processing capacity of the facility by increasing the percentage of biosolids within the in-feed compost mix from 45% to over 55% (by weight). Process improvements and cost-effective predictive and preventative maintenance have led to the elimination of production downtime and have resulted in extremely reliable service to the City of Baltimore. USFilter also concentrated on product marketing which, combined with improved product quality, has led to high market demand.

The Baltimore City Compost Facility utilizes an enclosed in-vessel biosolids composting technology that can accept and process up to 210 tons of dewatered biosolids per day. The City of Baltimore supplies the Compost Facility with biosolids produced at its Back River Wastewater Treatment Plant. The biosolids are transported to the facility, unloaded into large bins and mixed with various wood amendments. From that point, the material begins a fourteen-day process of in-vessel composting that takes place in two large concrete reactor channels. Each channel is divided into cells equipped with independent aeration systems, capable of either negatively aerating (drawing air down through the compost mixture) or positively aerating (forcing air upwards through the mix) the blend. Oxygen, moisture and temperature are carefully monitored and controlled to achieve maximum decomposition efficiency. The compost is turned within the reactor cell once within the fourteen-day retention period to further agitate and aerate the mix and ensure homogeneity. The use of a two-stage chemical mist scrubber reduces odor emissions and complies with air permit requirements.

Once the in-vessel process is complete, the compost is placed on an aerated curing pad where its temperature is elevated and sustained to provide complete sterilization required under Federal 40 C.F.R. Part 503.32 and 503.33 for a Class A end product. Completing the compost cycle requires a minimum of 44 days from introduction into the reactors and continuing through the extended curing period. Finally, the material is screened to separate fines, and the primary product is ready for sale.

The finished compost is registered and sold as a soil amendment under the trade name ORGRO(r) High Organic Compost. ORGRO is sold in bulk to topsoil manufacturers, nurserymen, contractors, landscapers, golf courses and professional turf managers and commercial growers throughout Maryland and Virginia. The compost contains valuable nutrient and soil amending properties and is beneficial in the manufacture of topsoil, production of sod and turf grass, nursery shrub and tree propagation and commercial potting soil blends. ORGRO compost is purchased regularly for use on numerous high profile properties, including the lawn of the United States Naval Observatory, Official Residence of the Vice President of the United States.

Space limitations at the facility do not allow for storage of excess product during seasonal demand. USFilter has addressed this issue by developing a marketing plan based on price incentives and dealership networks. Product pricing includes volume discounts to promote high quantity sales, reduced pricing for dealers who consistently purchase large quantities of compost on a monthly basis and off-season (November-February) pricing to promote winter sales. Dealers are able to purchase and stock large quantities of material at a reduced cost in preparation for increased sales in the spring. The

ability to offer their clients larger volumes of compost product allows USFilter to decrease their unit cost of sale while maintaining a high level of customer service.

The marketing efforts and product quality improvements have paid off. The Compost Facility has increased production and sales revenue by 14% and 11%, for 1999 and 2000, respectively over previous years. Currently, the Facility markets and distributes approximately 75,000 cubic yards of compost per year and has consistently sold out of its high quality compost product since 1997. For the first time since beginning commercial operations in 1988, and for the past two years, product sales revenues have escalated to a level at which revenue is shared with the City of Baltimore.

Under the operation, maintenance, and management of USFilter Operating Services, the Baltimore City Compost Facility continues to thrive as an award-winning biosolids composting facility and demonstration site. The Facility was recently awarded the 2001 OpEx Award by USFilter, in recognition of its achievements in operational excellence (OpEx) based on safety and regulatory compliance as well as financial performance. The facility is toured annually by the University of Maryland's nationally recognized Better Composting School, a training program for compost operators and professionals. Johns Hopkins Environmental Engineering students also tour the facility as part of their curriculum. In October 2001, the Solid Waste Association of North America (SWANA) offered a tour of the facility to those attending its annual national convention. USFilter is committed to continuing to deliver the quality, reliability and outstanding service that have become expected at the Baltimore City Compost Facility. 🍁



The Baltimore City Compost Facility.

A Tribute

—By Floyd B. Johnson

I trust by now all of you know that our own Pearl Laufer received the National WEF Public Education Award for 2001. It is altogether fitting and proper that she was the recipient of this exceptional accolade. It is always special when a member of the organizations we serve receives such accord, but here at the *Ecoletter*, it is even more so. We are fortunate indeed to have her on staff as a co-editor.



When I read the brief summary of Pearl's accomplishments in the October 2001 issue of *Water Environment & Technology*, I was both amazed at the long list, and disappointed at one glaring omission. No mention was made of her work at the *Ecoletter*. This is like looking through a telescope and failing to see the moon. There is no question in my mind that the *Ecoletter* is an eagle feather in her well plumaged hat. For over a decade she has applied high energy, intellectual horsepower, and lofty standards to make this publication what it is today. Our recent 30th anniversary issue shows just how far the *Ecoletter* has come. Pearl is the glue, the mother hen, solicitor general and driving force behind what you read on these pages. We might be co-editors, but she is the sr.editor.

When we plan an issue, she easily has the most material. She has a way of going into the orchards full of her contacts and shaking the trees so that they drop their fruit. It is not that she is successful in all her attempts at getting authors to step forward, but when you know as many people as Pearl, even a measly percentage brings ample material. Her combinations of persistent arm twisting and friendly persuasion sure works for us at the *Ecoletter*. She just has a way of getting next to you. From concept, through details to final product, she shepherds the way as a table full of papers becomes something you can hold in your hand.

Personally, I have found Pearl to be genuinely supportive of my fledgling steps as her co-editor. Through her efforts, I have learned what is involved in publishing a product that I am proud of. She showed patience while I went fishing in uncertain waters for a printer worthy of keeping. She is open to new ideas and shows a wholehearted willingness to change how and what we print. Not once has she turned me down on a piece I wanted to include in an issue. While we work for the same company, until I joined the *Ecoletter*, our paths infrequently crossed. I now know what I had been missing. Working with her is an uplifting experience. Her active mind is contagious like laughter. Pearl's office is advertising for the many contents of her mind. It is not a large space, but it is largely occupied. Art, philosophy, humor, politics (she ain't bashful) and all sorts of water posters decorate the walls, desk and door. All this serves as a primer education on Pearl's interests and talents.

I am particularly impressed with Pearl's ability to work with engineers. As an engineer, I have some feelings for the blessings and curses we can bring to common matters. While it is true she is Dr.Laufer, that illustrious title owes to English course work and is far removed from anything to do with BOD and such. Before coming to the WSSC a baker's dozen years ago, she had little preparation for the wonderful world of water. Ah, but she is a quick learner and soon adapted to our issues and lingo. She now is conversant on a host of topics and, as the award notes, can educate on them. Yes, she can talk. I have never known her to be reticent when a conversation commences and she somehow manages to contribute relevant information on far ranging subjects.

So it makes us lucky to have such a capable and distinguished professional serving as co-editor. She has rubbed a lustrous shine on our pages and has brightened our minds. I know I speak for the rest of the *Ecoletter* staff when

I say how much of a pleasure it has been to work with her. Now if any of you hear any talk of Pearl moving on to bigger affairs, please step in to squelch that talk. Not having her at the *Ecoletter* is a most unwelcome thought. 🍁