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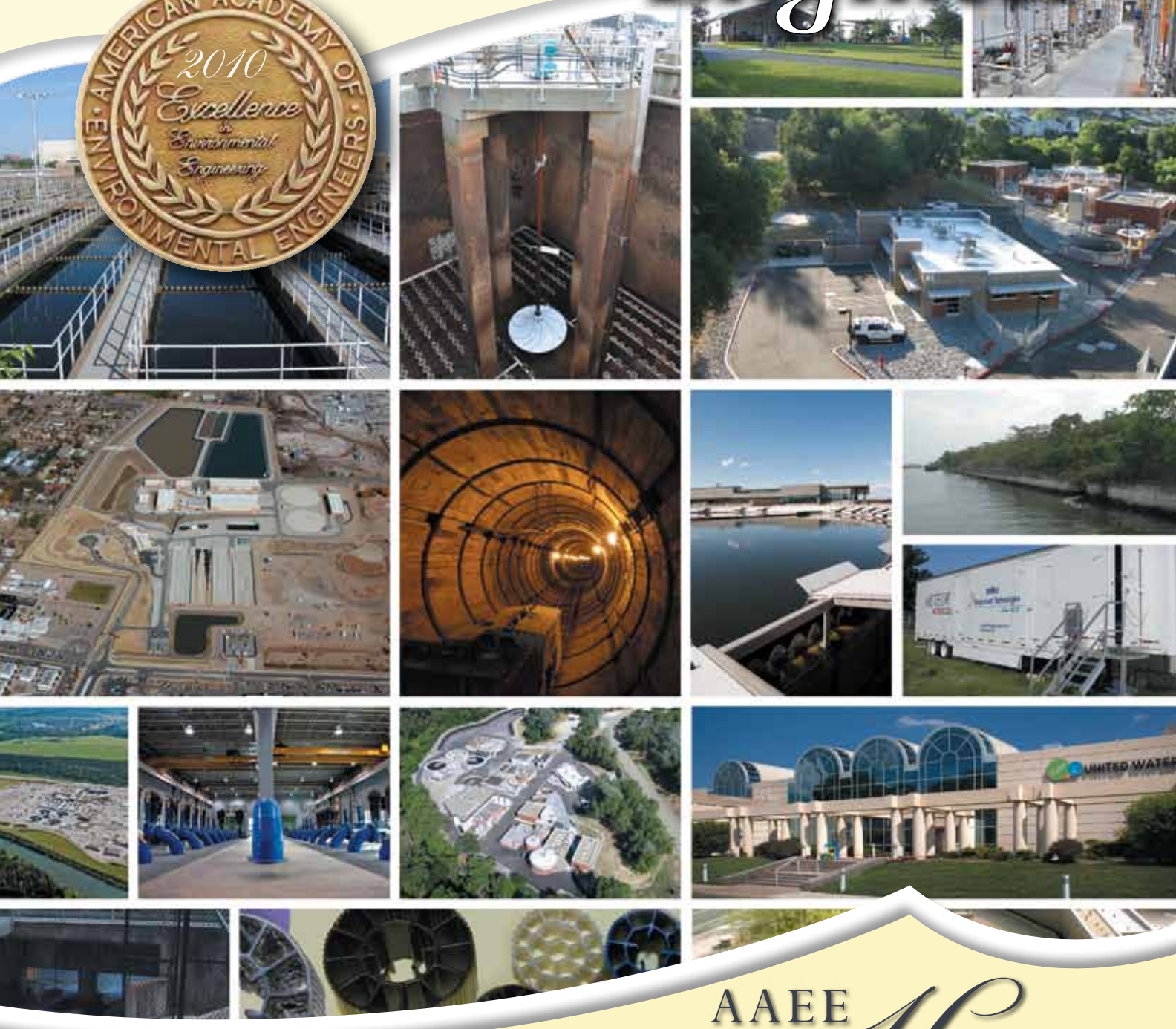
ENVIRONMENTAL Engineer



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ENVIRONMENTAL Engineer

Spring 2010 | Volume 46, Number 2

FEATURES

2010 Excellence in Environmental Engineering®

DEPARTMENTS

by Cecil Lue-Hing, D.Sc., P.E., DEE, Hon.M.ASCE, NAE

The Road to Professionalism

In my last piece I promised to tell you something about why I joined, what I have gained, why I feel enriched, my thoughts for the organization, and some comments about the Class of 2009.

Like most recent graduates, I was thrilled to be "free at last," to be unburdened of the yoke of classes and laboratories, and was now ready to take on a world just waiting to be conquered in the image of the engineer I hoped to be. But wait! As a freshly-minted engineer, I pondered: what have I got to offer this world I wish so much to conquer? After some soul searching, I concluded that I did have something to offer such as some basic skills, the desire to improve these skills through hard work, a vast capacity for learning, the realization that to be successful I would need a lot of support and mentoring, and the will to endure the rigors of becoming the professional I aspired to be. It slowly began to dawn on me that the road to professionalism, or to becoming an engineer of some stature, involves more than just work; it also requires a lot of interaction with one's peers, the grown-ups for heaven's sake, earning their respect, and along the way, helping others to succeed.

As the mileage began to slowly accumulate on my young career, it became more and more clear that the value of peer interaction is priceless, and that one straight pathway to earning peer respect, or at least peer recognition, is through credentialing. It was about this time that I was beginning to accept the fact that true professional development and peer interactions are inseparable, and if I aspired to interact with the one group of professionals that are certified as Environmental Engineers in the US, I had to pursue AAEE certification.

So, enough soul searching, I joined! Now having joined, what have I gained, and why do I feel enriched?

I was never one to believe that every professional decision I make had to result in an obvious profit center, and the decision to pursue AAEE certification is a case in point since the decision was not then a requirement for my professional promotion, advancement, or for monetary gain. I personally viewed the decision as a long-term investment in my professional integrity, a vehicle through which I could gain professional recognition by my peers, not necessarily for compensation, but as a minimum, for a lasting lift in professional stature. And not to be denied is the fact that this decision did enhance my professional profile. Over the years, I have found that being credentialed by AAEE has, in several subtle ways, enriched my professional experience, sometimes by my being the only one in a professional setting so credentialed. I find this personally rewarding, and enriching, and it is within this context that I greet the "Class of 2009."

So, I offer a hearty welcome to the 134 strong "Class of 2009" who have elected to seek and obtain AAEE certification. These inductees represent environmental engineering professionals from consulting (~69%), government (~17%), academia (~10), industry (~2%), and the military (~2%) – certainly, a very respectable representation of workplace categories. While I am pleased to see the number of candidates from consulting continues is strong, I'd also like to see a stronger representation from the other work sectors, and this is a challenge we will take on. However, a very pleasant statistic from this Class of 2009 is the number of female professionals who were inducted, about 16%. Let us hope that this number of female inductees is just the beginning of a steady and growing stream that will continue to swell the rolls of the Academy. While this 2009 census of female certificants is heartening, I know that we can do better and plan to work toward this goal. We need their presence, their temperament, the expertise they collectively bring to our professional talent pool, and we need a lot more of them to join us.

My thoughts looking forward for the Academy include seeing the organization grow not for the purpose of sheer size, but to achieve the critical mass necessary to support valuable programs. These include important student development initiatives such as creating a strong cadre of Student Chapters, providing assistance, mentoring, and recognizing student achievement. Since the Academy is not directly involved in the student training business, we will for these initiatives, need the concurrence and support of the academic community (e.g., the AEESP) and we are currently engaged in the process of strengthening relations with this community. EE

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2010 Annual Directories

The 2010 edition of *Who's Who in Environmental Engineering*® and the *Environmental Engineering Selection and Career Guide* will be mailed by mid-June.

2010 Membership Drive

The deadline for submitting BCEE and BCEEM applications for the 2010 cycle was March 31. Applications will be reviewed in April and regional examinations are expected to begin in June. Examination dates will be posted to the AAEE website as they become available.

2011 Officer Nominees

Profiles for the 2011 officer nominees are included in this issue of *Environmental Engineer.* Ballots will be mailed in May. Please vote! Ballots are due June 15. See election results in the Summer issue.

AAEE Meetings

- New Jersey Water Environment Association will hold its 95th Annual Conference, May 10-13 at Bally's Hotel, Atlantic City, NJ. AAEE is presenting a full-day workshop on Monday, May 10 (*Clean Water Act & the Role of Environmental Engineers: Time for a Change?)* It will offer NY and NJ TCHs. The AAEE breakfast will be on May 11 at 7:00 a.m. and will feature Alan Vicory offering a forum discussion on the results of Monday's workshop. AAEE will also be exhibiting and volunteers are needed. Registration information is available at www.njwea.org.
- AAEE/AIDIS/AWWA Luncheon will be held on Wednesday, June 23 at the Sheraton Hotel & Towers in Chicago, 11:30 a.m.-2:00 p.m. AAEE will exhibit at the Conference (June 20-24). *Organized by Steven Quail.*
- AAEE/AWMA Breakfast will be held Wednesday, June 23 at the Hyatt in Calgary (7:00a.m). The Trickle-Down Effect of Clean Water Sustainability will be discussed. AAEE will exhibit at the Conference (June 22-24). *Organized by Gary Gasperino.*
- AAEE will host a breakfast (August 17) and exhibit at APWA's International Public Works Congress & Exposition in Boston, MA, August 15-18. The Breakfast will feature Jason E. Cosby, P.E., Director Public Works, City of Virginia Beach, speaking on Effective Public Works Management in the Next Decade. *Organized by Lamont "Bud" Curtis.*
- AAEE/AIDIS/WEF Breakfast –Monday, October 4 in New Orleans, LA. AAEE will exhibit. *Organized by Dick Kuchenrither.*

Stay Connected

AAEE likes to keep its membership updated. If you haven't been receiving our e-broadcasts and e-newsletters, or if you have unsubscribed, simply update your information with AAEE Headquarters. AAEE does not distribute or sell emails to third parties. Other ways to stay connected is by joining us on Facebook or LinkedIn. Visit the AAEE home page for more information and links. EE

DID YOU KNOW?

There have been 17 Superior Achievement award winners in the Excellence in Environmental Engineering Competition since it was created 16 years ago. Two projects received E3's highest-ranking in 2004: CDM for Gilbert Mosley Project and City of Los Angeles, Department of Public Works, Bureaus of Engineering, Sanitation and Contract Administration for First Major Biosolids Facility in USA to Achieve Pathogen-Free Standards.

by Joseph S. Cavarretta, CAE

Convergence and collaboration

"Given the state of the economy, the world, and environmental affairs, many are recognizing the need to converge and collaborate."

Being Executive Director of AAEE sometimes feels like sitting in the cockpit of a jumbo jet where I serve most often as copilot or flight attendant, sometimes as cheerleader, and sometimes as pilot. This is pretty much the case among most association executive directors. We're all in charge of doing what it takes to navigate our associations to achieve our missions safely and successfully.

In my job, I assist the staff, AAEE President Cecil Lue-Hing, the Executive Committee and the BOT, the Foundation Board, committee chairs and members, state representatives, workgroups, and individual members. Each is integral to the organization's success. Each adds unique talents, attributes, and functions to the organization. AAEE members are truly fortunate to have such a hard-working and dedicated crew. (We are always seeking members who want to get involved. If you want to participate, email jcava@aaee.net.)

From this "virtual cockpit" one sees other jumbo jets flying in the same general direction. Some are AAEE Sponsoring Organizations (with representation on our Board of Trustees), subsets of those organizations, affiliated organizations, and other entities. There are more organizations out there, some identified, others not, offering potentially valuable, mutually beneficial opportunities to the environmental engineering and related communities.

What's happening? Given the state of the economy, the world, and environmental affairs, many are recognizing the need to converge and collaborate. For example, AAEE and sponsoring organizations, their chapters, and some affiliate organizations are working hard to achieve meaningful cooperation. The Academy is not only active at WEFTEC, exhibiting and hosting a breakfast, but also hosting events and breakfasts at WEA Chapter conferences such as NYWEA and NJWEA. The Academy is also involved in co-sponsored conferences such as NCWWA/NCWEA; AWWA Annual Conference; the AIChE Annual Conference and AIChE Spring Meeting; A&WMA Annual Conference, APWA Annual Conference, SWANA, AEESP, and much more. Our student chapters are involved with sponsoring organizations' student chapters and hosting joint events; our Awards program is branching out to interact with more organizations; the list goes on.

The value of this collaboration to each individual member of each organization is enormous as no single organization can offer the value that we can all achieve through cooperation. Each individual organization offers unique value propositions that cannot be found elsewhere. That is why so many of us find it useful to maintain memberships in many organizations. Yet together, collaborative organizations offer unprecedented learning, participatory, and networking opportunities.

To help benefit you, the Board Certified Environmental Engineer, the Board Certified Environmental Engineering Member, the non-certified Member, and Student Member, I am planning to offer two schematics in the next issue of Environmental Engineer. One will focus on AAEE committees and the other will detail our collaborations with Sponsoring Organizations, SO Chapters, and affiliated organizations. These will become living documents and resources that will be made available to the general membership online once completed.

I will need your assistance. For example, AAEE State Representative in Puerto Rico Lorenzo R. Iglesias, P.E., BCEE, contacted me last week to say that the College of Engineers and Land Surveyor of Puerto Rico recently created an Institute of Environmental Engineers. Its new President, Edgardo N. Martinez, PE, BCEE, has urged the Institute to conduct activities in conjunction with local BCEEs and BCEEMs.

If you know of other initiatives involving AAEE and its members, or, if you wish to initiate collaborations or increase existing collaborations, please email me details at jcava@aaee.net.

Thank you for your time and assistance. EE

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On The Move

Yves E. Pollart, P.E., BCEE, is among three employees promoted to Vice President at RETTEW Associates, Inc. He previously held the position of Director of Environmental Engineering. Mr. Pollart has been board certified in Water Supply and Wastewater Engineering since 1997.

Awards & Honors

Peter Tunnicliffe, P.E., BCEE, DBIA, received the Design-Build Institute of American (DBIA) Distinguished Design-Build Leadership Award. This award is presented to individuals who have demonstrated leadership in the advancement of best design-build practices and of design-build as the project delivery method of choice. He is currently Senior Vice president of CDM. Dr. Tunnicliffe has been board certified in Water Supply and Wastewater Engineering since 1987.

In Memoriam

Dr. Roy Dragone, P.E., BCEE, of Baltimore, Maryland, passed away in June 2009. Dr. Dragone, a Life Member, had been board certified in Sanitary Engineering since 1959.

John L. Mancini, P.E., BCEE, certified member of the American Academy of Environmental Engineers in Water Supply/Wastewater since 1975, passed away on January 12, 2010, after a brief illness. Nationally and internationally recognized in the water and wastewater field, John Mancini made significant technical and scientific contributions in the development and application of technology to address environmental issues. A man of vision, he had more than 40 years experience related to water quality issues and was involved in projects throughout the US. His experience included studies that had an impact on large water bodies as well as extensive geographic areas. He was involved in the modeling of several Texas rivers and reservoirs including the Trinity River, the Guadalupe River, Lake Livingston, and Eagle Mountain Lake. His national modeling experience included completing dissolved oxygen studies in numerous estuaries throughout the US including New York Harbor, Chesapeake Bay, Boston Harbor, and Charleston Harbor. He completed eutrophication modeling in many coastal areas in the United States. He designed and completed evaluation and design of ocean outfalls on the Atlantic, Pacific, and Mediterrean coasts. John served as a consultant to the US Environmental Protection Agency's (EPA) Science Advisory Board on a project addressing new technical methods for developing water quality criteria. He authored numerous scientific papers related to environmental engineering and has been published in many trade journals.

With a bachelors of civil engineering degree in sanitary engineering from Manhattan College in 1958 and a master of science degree from the University of Wisconsin in 1959, John served as President of Hydroscience, Inc., from 1961 to 1978; as an adjunct professor of environmental engineering at Manhattan College from 1973 to 1978; as President of John Mancini Consultants, Inc., from 1979 to 2009; and as a Board member of Alan Plummer Associates, Inc., from 1989 to 2009.

John was a registered professional engineer in 14 states. Throughout his career he was active in the Water Environment Federation (WEF) and served on the Federal Advisory Committee addressing urban wet weather discharges. He also co-chaired the WEF Task Force to evaluate the EPA sedimentation criteria program.

John enjoyed historical writing and authored three novels: Crisis in Spain: *During Rome's 2nd Punic War, The Eyes and Ears of Rome in Spain, and Defending the Roman Republic: Ending the 2nd Punic War.* He and his wife Marilyn enjoyed traveling and birding.

He is survived by Marilyn, his wife of almost 50 years, son John A. Mancini, daughter Lori Elphick, and granddaughter, Michaela Mancini.

"I initially met John in about 1968 when the firm that I was with selected the best talent in the US to perform some water quality modeling in Texas. That person turned out to be John Mancini.... Almost from the very beginning of Alan Plummer Associates, Inc., John fulfilled several roles in helping the company be successful. As a Director on the Board, he provided valuable input into decisions about the company's operations. John also provided a vision for the future challenges that our clients were going to have to address and helped equip our staff to be in a position to provide the services needed by our clients to meet those challenges. John always emphasized that the company had an obligation to provide high quality engineering and scientific services. He also made it very clear that the company and the staff had to act with integrity. " --Alan H. Plummer, Jr., P.E., BCEE, Chairman of the Board, Alan Plummer Associates, Inc. EE

Officer Nominees for 2011

The Academy's Nominating Committee is chaired by Past President Debra R. Reinhart. Its members include Pasquale S. Canzano, Tapas K. Das, William P. Dee, Brian P. Flynn, Hector R. Fuentes, Jeffrey H. Greenfield, Howard B. LaFever, Michael W. Selna, Sandra L. Tripp, Cecil Lue-Hing. The committee recommends the following slate of candidates:

President Elect	Michael W. Selna, P.E., BCEE
Vice President	Pasquale S. Canzano, P.E., BCEE Hector R. Fuentes, Ph.D., P.E., BCEE
Trustee-at-Large	Joseph F. Malina, Ph.D., P.E., BCEE Jeffrey A. Mills, P.E., BCEE Ronald D. Neufeld, Ph.D., P.E., BCEE Richard J. Pope, P.E., BCEE

PRESIDENT ELECT

Michael W. Selna, P.E., BCEE, is the former Assistant Chief Engineer/GM of the Los Angeles County Sanitation Districts, an agency providing wastewater collection/treatment and solid waste management for 5.2 million constituents. He served on the staff of the Sanitation Districts for 36 years after earning a B.S. in Civil Engineering at UC Berkeley in 1970 and an M.S. in Environmental Engineering at UC Davis in 1973. His career included wastewater research, solid waste operations, and oversight of design and construction of $100 million/year of wastewater and solid waste infrastructure prior to his executive management role.

Mr. Selna has a keen interest in stimulating young people to become Environmental Engineers. He is Chair of Environmental Engineers of the Future (E2F), a non-profit organization providing funding for Masters Degrees in Environmental Engineering. E2F, a partnership among agencies and firms involved in water, wastewater, and solid waste management linked to 65 universities, has provided over $1 million to students since 2005.

Elected to the Academy Board of Trustees (BOT) in 2006, Mr. Selna has served on the following committees: Planning, Finance, Sustainability, Engineering Education, Awards, Nominating, and the Executive Committee. He established the Seminars and Workshops Working Group which has provided regional and national events for the Academy. In 2010 he became chair of the Membership Committee.

Mr. Selna is committed to strengthening the Academy's reputation as the foremost certifying organization for Environmental Engineers through continued implementation of its strategic plan, growth in membership, enhanced demand for BCEEs and BCEEMs, collaboration with the academic community, attention to changing demographics, and inclusion of students.

VICE PRESIDENT

Pasquale S. Canzano P.E., BCEE, has 45 years of engineering experience predominantly in public service. He is currently the Chief Executive Officer of the Delaware Solid Waste Authority (DSWA), which is recognized nationally and internationally as a leader and innovator in solid waste management. DSWA is responsible for implementing a Statewide Solid Waste Management Plan for Delaware and safely manages about 900,000 tons per year of solid waste within a $70 million budget.

Mr. Canzano earned a B.S. degree in Chemical Engineering from Northeastern University in 1965 and an M.S. degree from The Polytechnic Institute of Brooklyn in 1971. He is a registered professional engineer in Delaware since 1974. In 2009, he was selected as Delaware's Engineer of the Year by the Delaware Engineering Society. He has authored papers on the topics of solid waste management and sludge recycling and has made presentations nationally and internationally on these subjects. He also taught a course on introductory fluid mechanics at Wesley College. He has patented developments in chemical adsorption/desorption processes, low-pressure gas regulating valves, and organic based Rankine power cycles for solar and waste heat recovery applications.

Mr. Canzano has been active as a Diplomate since 1990, has served on various committees, currently chairing the Audit committee. He has served on the Board of Trustees for the past seven years representing AIChE as a sponsoring organization. He is an active member of SWANA, ISWA and DAPE.

Mr. Canzano strongly supports the Academy and certification within his organization and externally. He believes that it is a priority to continue to improve the image of the professional engineer, value and prestige of Board certification.

Hector R. Fuentes, PH.D., P.E., DEE, is currently a Professor of Environmental and Water Resources Engineering at Florida International University (FIU). At FIU, Professor Fuentes has been honored with the Awards for Excellence in Research, Teaching and Service. Before joining FIU, he was a faculty member at New Mexico Tech and at the University of Texas, El Paso. He holds M.S. degrees in Environmental Engineering and in Engineering Management and a Ph.D. degree in Environmental and Water Resources Engineering from Vanderbilt University (1982). He is currently an active member of the Association of Environmental Engineering and Science Professors (AEESP), the Water Environment Federation (WEF) and the American Academy of Environmental Engineering (AAEE). Dr. Fuentes was elected Trustee of the Academy in 2007 representing AEESP and currently serves on the following committees: Executive, Honors and Awards, Re-Certification and Hazardous and Waste Management. He was a founding director of Tau Chi Alpha, the National Environmental Engi-

neering Honorary, which recognizes and honors undergraduate and graduate students, alumni and practitioners that excel in environmental engineering. He has also served on governmental, professional and citizen boards and committees.

Dr. Fuentes' 37-year professional career has focused on environmental and water resources engineering, solid and radioactive waste management, pollution prevention, green engineering and sustainability. During the '80s, he was a research scientist at Los Alamos. His research effort has been sponsored by DOE, NRC, EPA, NSF and NASA, among others. His research publications have been in the area of fate and transport of inorganic and organic contaminants in porous media, including sorption phenomena. He was a senior consultant with Woodward-Clyde Consultants, and has served as a Consultant to UNESCO, USAID, EPA, NSF and the Inter-American Development Bank. He co-authored the AAEE publication *Practice Problems for the P.E. Examination in Environmental Engineering.* In addition to his research, Dr. Fuentes' contributions have also included the development of engineering courses and accreditation programs. He is committed to the Academy's strategic plan, servicing the members, including students, and expanding the synergy between the sponsoring societies and AAEE

TRUSTEE-AT-LARGE

Joseph F. Malina, Jr., PH.D., P.E., DEE, D.WRE, is the C.W. Cook Professor in Environmental Engineering at The University of Texas at Austin. He earned a BCE, Manhattan College, 1957, MSCE, 1959 and a Ph.D., 1961, University of Wisconsin. Joe joined the faculty at The University of Texas at Austin in1961 and has taught courses in water and wastewater treatment engineering, solid waste engineering, and design of wastewater and water treatment plants during his 45-year tenure. Currently his research interests include biological treatment of wastewaters, anaerobic biotransformation of wastewater, biosolids, and solid waste to methane ("green energy"), and solid waste resource & energy recovery engineering.

An AAEE Diplomate since 1972 and Life Member (2004) his Academy committee service includes Goals and Administration (1980-81), Co-Chairman of Membership (1982-88), Education (1982-88), Board of Trustees (1991-94). He represented the AAEE on the ABET Engineering Accreditation Commission in 1982-87 and currently is an EAC/ABET evaluator for environmental and civil engineering programs. He also served on the ABET Board of Directors (2002-2003).

Joe contributed more than 270 technical and professional publications and organized and lectured in short courses on municipal and industrial water, wastewater, and sludge treatment, solid waste engineering, and highway runoff characteristics, control and treatment. He received the Life-Time Achievement Award, 2006, WEAT, WEF Gordon Masked Fair Award, 1994 and AAEE Gordon Maskew Fair Award, 1984, and Arthur Sidney Befell Award, 1985 - WEAT and WEF among others. He is a Life member of ASCE, AWWA, and WEF. He was President of the TWPCA (1975-76) and Director, WPCF (1981-84) a Founding member (1999) of the EWRI. He is a licensed professional engineer in Texas and a member TSPE and NSPE.

Jeffrey A. Mills, P.E., BCEE, joined CDM, a global consulting, engineering, construction, and operations firm based in Massachusetts, in 1983 as project engineer and was promoted to Vice President in 2008. He has 36 years of experience in environmental engineering. He earned a bachelor's of science degree in thermal and environmental engineering from Southern Illinois University at Carbondale.

Throughout his career, Mr. Mills has been involved in management, design, and construction for municipal water and wastewater systems. He is a registered Professional Engineer in six states. His greatest strengths lay in his ability to mentor staff and provide technical guidance and expertise on complex, multi-disciplined, high-cost environmental undertakings.

Together with CDM's other technical leaders, Mr. Mills focuses on providing clients with innovative solutions and sound economical treatment plant designs. He excels in environmental management across a broad range of disciplines, including water, regulatory compliance, and wastewater.

Career highlights include planning, design, and construction for some of the largest water and wastewater treatment facilities in the U.S. Over the past 12 years, he has been responsible for over $1B worth of water and wastewater treatment plant facility design and construction.

Mr. Mills joined the American Academy of Environmental Engineers in 1987 - serving on the Education (1993-2000) and Admissions (2002-present) (Vice Chair since 2006) committees,and as Georgia State Representative since 2004. He is an active member of National Society of Professional Engineers, Florida Engineering Society, Georgia Association of Water Professionals, Water Environment Federation, Construction Specifications Institute, and American Water Works Association.

Ronald D. Neufeld, PH.D., P.E., BCEE, is a Professor of Civil and Environmental Engineering at the Swanson School of Engineering, University of Pittsburgh and has been on the faculty for 37 years. He was a Senior Fulbright Scholar (1983-84) teaching Environmental Engineering participating in research looking at water and waste issues relating to oil shale development. Dr. Neufeld is a licensed Engineer in Pennsylvania, and holds a PhD (Civil/Environmental Engineering) from Northwestern University, MS from Northwestern, and BE from The Cooper Union.

Dr. Neufeld is a member of the AAEE Education Committee (1992-present), and the Academy User Outreach Committee. He also serves AAEE as an ABET Program Evaluator for University Environmental Engineering programs seeking accreditation. He is appointed to the Pennsylvania State Board for Certification of Sewage Treatment Plant and Waterworks Operators, is Vice-Chair of the PA-Department of Environmental Resources "Cleanup Standards Science Advisory Board, and Past-chair and member of the ASCE Energy Division Executive

Committee. He is an Associate Editor of the ASCE Journal of Energy Engineering, and member of the Water Environment Federation Industrial Waste Committee and WEF Program Committee.

Dr. Neufeld's interest is focused on generating excitement for and the development of young environmental engineering professionals. He teaches both graduate and undergraduate environmental engineering courses within the Pitt Department of Civil & Environmental Engineering. In addition, he with his students have contributed over 150 archival papers, proceedings and presentations with a general emphasis on process innovations and fundamentals associate with industrial and municipal wastewater treatment technologies.

Dr. Neufeld's awards include the PA Water Environment Association Professional Research Award, ASCE Outstanding Service Award, Roy F. Weston Award, a William Kepler Whiteford Professorship and listing in Who's Who in America.

Richard J. Pope, P.E., BCEE, is an environmental engineer who for the last 31 years has focused on providing air and odor services for municipalities and industries. A Vice President at Malcolm Pirnie, Inc., where he directs a team of odor specialists providing comprehensive odor services, Dick has conducted over 250 odor-related projects at wastewater facilities, landfills, composting and industrial facilities in cities nationwide and globally from Canada and Mexico to Brazil and Australia.

Dick holds bachelors and masters degrees in Civil Engineering and Environmental Engineering from Manhattan College and PE licenses in New York and Michigan. A Board Certified Environmental Engineer for nearly 10 years, Dick has held responsible roles in professional organizations, including the Academy, the Water Environment Federation (WEF), and NYWEA (a WEF state member association) where he chairs and participates on various key committees. In addition to his more than 125 presentations and lectures at conferences/workshops and colleges that provide insight and training on his body of work, he is a contributing author on several WEF publications/Manuals of Practice on odor control-related topics. In addition, for the past five years he has developed a presentation summary of the key AAEE annual award winners that members can download to view and/or use at local gatherings or school expos.

Training and educating is a consuming interest for Dick, not only to his professional peers, but especially educating children from kindergarten through high school about the engineering profession. Besides reaching out to youngsters annually at his local school district and at the NYWEA Spring Conference, Dick has also created interactive presentations for parents to give to their children's classes. As Chair of AAEE's K-12 Committee, Dick is now striving to educate children nationwide through the Academy about the advantages, challenges and benefits of environmental engineering. EE

A&WMA'S 103rd ANNUAL CONFERENCE & EXHIBITION

JUNE 22-25, 2010 • CALGARY TELUS CONVENTION CENTRE • CALGARY, ALBERTA, CANADA

Join the Air & Waste Management Association (A&WMA) for our 103rd Annual Conference & Exhibition (ACE), the environmental industry's premier education, networking, and solutions event!

ACE 2010 will feature:

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- Professional development courses taught by industry leaders
- An expansive exhibit hall
- Fun social and networking events
- And much more!

Based around the conference theme "Energy and Environment" the ACE technical program will explore a wide range of related issues including the future of fossil fuels, alternative energy solutions, and greenhouse gas emissions management, innovation, and technology.

www.awma.org/ACE2010

CALGARY 2010

AIR & WASTE MANAGEMENT ASSOCIATION

The American Academy of Environmental Engineers Honorees

2010 Honorary Member: *George R. Crombie*

This individual is elected in recognition of their position of eminence in the environmental engineering field, their sustained contributions to the advancement of environmental engineering.

George R. Crombie is a Senior Faculty Member for Public Works Administration in the School of Graduate Studies at Norwich University. He holds an A.S. and B.S. Degree from the University of New Hampshire and Master of Public Administration from Northeastern University in Boston, MA. He has served as Secretary of Environmental Affairs for the State of Vermont, Undersecretary of Environmental Affairs for Massachusetts, and a long time public works-utility director. Presently Mr. Crombie is the president-elect of the American Public Works Association.

Mr. Crombie has guided numerous award winning public works-environmental projects using a systems thinking approach that balances environmental, economic, and quality of life challenges. He was one of the original pioneers of sludge composting in the early seventies, member of the regional green gas initiative to trade carbon credits. He is a member of the EPA national committee on climate ready utilities working group, and was selected by the Aspen Institute in a dialogue on Sustainable Water Systems: Step One-Redefining the Nation's Infrastructure Challenge. In 2008, Public Works magazine named Mr. Crombie one of the 2008 trendsetters in the US for spearheading the development of the Climate Change Collaborative in Vermont, bringing together government, universities, and business to meet the challenges of climate change and a green economy.

In his career Mr. Crombie has published and lectured on public works and the environment. In the Fall 2008 issue of Environmental Engineer, he authored the feature article "Holistic Environmental Sustainability: The Next Frontier." He has received numerous awards including the APWA National Charles Walter Nichols Award for outstanding meritorious achievement in environmental field in the broadest sense, named by APWA as one of the Top 10 Public Works Directors in the US and Canada, the Gold Leaf Award presented by the International Society of Arboriculture, and Jennings Randolph International Fellowship to study solid waste practices in Slovakia and the Czech Republic. EE

2010 Stanley E. Kappe Award Recipient: *Michael W. Selna, P.E., BCEE*

This award is presented to an individual for their performance of extraordinary and outstanding service contributory to the advancement of Academy objectives.

Michael W. Selna, P.E., BCEE is the former Assistant Chief Engineer/GM of the Los Angeles County Sanitation Districts, where he served for 36 years after earning a B.S. in Civil Engineering at UC Berkeley in 1970 and an M.S. in Environmental Engineering at UC Davis in 1973. His career included wastewater research, solid waste operations, and oversight of design and construction of $100 million/year of wastewater and solid waste infrastructure prior to his executive management role.

Mr. Selna has a keen interest in stimulating young people to become Environmental Engineers. He is Chairman of Environmental Engineers of the Future (E2F), a non-profit organization providing funding for Masters Degrees in Environmental Engi-

neering. E2F, a partnership among agencies and firms involved in water, wastewater, and solid waste management linked to 65 universities, has provided nearly $1 million to students.

Elected to the Academy Board of Trustees (BOT) in 2006, Mr. Selna has served on the following committees: Planning, Finance, Sustainability, Engineering Education, Awards, Nominations, and the Executive Committee. He has also chaired the Workshops and Seminars Working Group and is presently Chair of the Membership Committee and Vice-President of the Academy.

Mr. Selna is committed to strengthening the Academy's reputation as the foremost certifying organization for Environmental Engineers through continued implementation of its strategic plan, growth in membership, enhanced demand for BCEEs and BCEEMs, collaboration with educators, attention to changing demographics, and inclusion of students. EE

2010 Gordon Maskew Fair Award Recipient:

Rao Y. Surampalli, Ph.D, P.E, BCEE, F.AAAS, DIST.M.ASCE

This award is presented to an individual for substantial contributions to the status of the engineering profession, the quality of the world's environment, and the Academy.

Dr. Rao Y. Surampalli received M.S and Ph.D. degrees in Environmental Engineering from Oklahoma State and Iowa State Universities, respectively. Rao is an Engineer Director with US Environmental Protection Agency (USEPA) and has been with EPA for the past 25 years. Additionally, he is an Adjunct Professor of Environmental Engineering at six universities.

Dr. Surampalli is a Registered Professional Engineer in the branches of Civil and Environmental Engineering, and also a Board Certified Environmental Engineer (BCEE) of the AAEE since 1985.

He has authored more than 450 technical publications and has traveled to many developing countries to share his Environmental Engineering expertise. He has provided technical assistance, facilitated technology transfer, and built technical capacity for numerous developed and developing nations including Brazil, India, Nepal, Taiwan, Japan, Thailand, Philippines, Namibia, Kazakhstan, Panama, Germany, Slovenia, Hong Kong, Ghana, China and Korea.

Rao has received ASCE's National Government Civil Engineer of the Year Award in 2006, for applied research Rudolph Hering Medal in 2006 and 2008, State-of-the-Art of Civil Engineering Award in 2007, Wesley Horner Medal in 2006, and WEF's Phlilip Morgan Award in 1986 and AAEE's Kappe Lecturer in 2009. A Distinguished Engineering Alumnus of both the Oklahoma State University and Iowa State University, Dr. Surampalli was elected a Fellow of the American Association for the Advancement of Science (AAAS) in 2005, a Member of the European Academy of Sciences and Arts (EASA) in 2008, and a Distinguished Member of the American Society of Civil Engineers in 2009. EE

2010 Edward J. Cleary Award Recipient:

Stephen R. Maguin, P.E., BCEE

This award is presented to an individual who displays superior administrative and technical skills and public service in the conduct of environmental protection programs.

Steve Maguin is the Chief Engineer and General Manager of the County Sanitation Districts of Los Angeles County, a regional partnership of 24 independent districts providing wastewater and solid waste management systems to 5.5 million people in a service area encompassing 78 cities and the unincorporated area in Los Angeles County. The Districts operations include 10 water reclamation plants, a large ocean disposal wastewater management facility, a biosolids management program, state-of-the-art landfills, recycling and transfer facilities, solid waste-to-energy facilities, and wastewater and solid waste energy recovery facilities. Mr. Maguin has been with the Districts for 39 years in various capacities in both Solid Waste Management and Wastewater Management. He is a registered Civil Engineer and a Board Certified Environmental Engineer of the American Academy of Environmental Engineers. He holds degrees from Loyola Marymount University in Civil Engineering and Stanford University in Environmental Engineering. EE

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2010 Excellence in Environmental Engineering®

THE EXCELLENCE IN ENVIRONMENTAL ENGINEERING® competition of the American Academy of Environmental Engineers seeks to identify, reward, and promote projects which typify quality in all facets of environmental engineering practice. Since being launched in 1989, the E3 competition has singled out projects and programs for recognition which testify to the genius of mankind and demonstrate a commitment to quality, comprehensive, and revolutionary solutions to real-world problems which improve human life and the environment they serve.

Thirty-six projects were submitted for the 2010 E3 Competition. An independent panel of distinguished judges scrutinized and selected the best of the best. Entries were received in the categories of Design, Environmental Sustainability, Operations/Management, Planning, Research, Small Projects, and University Research. The newest category for 2010, Environmental Sustainability, received the second-most entries. Each entry is judged on five criteria:

- Demonstration of a comprehensive, integrated approach to the problem which considers all environmental media, i.e., air, water and land, in its solution.
- Quality as evidenced by the degree of user satisfaction and proven performance as established by written documentation.
- Originality and innovation, representing the application of new knowledge, a new application of existing knowledge or an innovative mix of old and new knowledge.
- The complexity of the problem or situation addressed.
- The extent the project contributes to or offers the prospect of contributing to social and economic advancement.

The judges awarded nineteen awards: 1 Superior Achievement, 8 Grand Prizes, and 10 Honor Awards. Summary profiles of the winning entries are on the following pages. Full profiles can be viewed on the AAEE website.

AAEE would like to thank the 2010 panel of judges for their time and expertise in analyzing the 2010 Excellence in Environmental Engineering Competition:

Walter J. Bishop, P.E., BCEE
Nicholas B. Cooper, P.E., BCEE
James H. Creager, P.E., BCEE
Tapas K. Das, Ph.D., P.E., BCEE
Douglas H. Eckmann, P.E., BCEE
Fred R. Gaines, P.E., BCEE
Gordon R. Garner, P.E., BCEE
Jay M. Herskowitz, P.E., BCEE
Frank D. Hutchinson, III, P.E., BCEE
Ashok Kumar, Ph.D., P.E., BCEE
Ulf M. Lindmark, P.E., BCEE
Jay M.K. Stone, P.E., BCEE
Mark A. Waer, Ph.D.
Robert C. Williams, P.E., BCEE

Superior Achievement Award

Patented Gaseous Electron Donor Injection Technology (GEDIT) for *InSitu* Biodegradation of Perchlorate and Nitrate

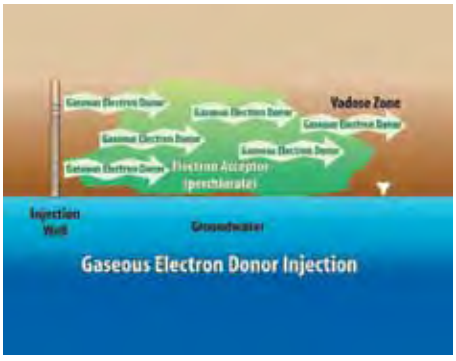
Rancho Cordova, California

ENTRANT: CDM
ENGINEER-IN-CHARGE: Patrick J. Evans, Ph.D.

CDM (a consulting, engineering, construction, and operations firm that services public and private clients worldwide) collaborated with the US Department of Defense Environmental Security Technology Certification Program (ESTCP) and Aerojet-General Corporation (a leader in aerospace and defense technology serving the missile, space propulsion, and defense market) to research, develop, and demonstrate an innovative, patented in situ process to remediate contaminants in deep soil. This process, Gaseous Electron Donor Injection Technology (GEDIT), was developed based on the concept that when provided an electron donor, certain bacteria will metabolize and destroy electron acceptors provided that oxygen is not present. Using a gaseous electron donor achieves high success rates due to the diffusivity of gas and its ability to travel through tight soil formation, such as silt and clay.

Previously, remediation technologies for perchlorate and nitrate were only able to treat contamination in groundwater, not in deep soil where contaminants originate. Both are highly mobile groundwater contaminants that pose serious threats to drinking water supplies. Perchlorate, a widely-used oxidizer in rocket fuel, munitions, fireworks, and road flares, is an endocrine-disrupting compound that can interfere with thyroid function. Nitrate contamination is primarily due to manufacture and storage of fertilizers, stockyards, and excessive fertilization in agriculture and is known to cause "blue baby" syndrome.

Field results were conducted at the Aerojet Inactive Rancho Cordova Test Site, an ideal site due to its history of rocket testing, propellant burning, and dredged mining which resulted in significant soil contamination. After an 8-month period of continuous gas injection at optimal conditions, final soil samples taken proved that GEDIT successfully remediated contaminants at the site. Results surpassed the 90% reduction goal – 93% of perchlorate and 94% of nitrate were destroyed. Other contaminants that can be treated with GEDIT include hexavalent chromium, uranium, technetium, selenium, TNT, and RDX. In addition to being a versatile technology, GEDIT is environmentally friendly due to low energy use and lack of water usage.



TOP LEFT: *CDM developed and patented gaseous electron donor injection technology, known as GEDIT, which involves injecting an electron donor into the ground as a gas, rather than a liquid. Gases such as hydrogen diffuse better in tight soil formations (such as silt and clay) and cause certain bacteria to metabolize and destroy perchlorate and nitrate in situ.*

TOP MIDDLE: *After continuous gas injection at optimized conditions for approximately 8 months, final soil samples proved that GEDIT successfully remediated contaminants at the site. The amount of perchlorate in the soil was reduced by 93% and nitrate was reduced by 94% – exceeding the 90% reduction goal.*

TOP RIGHT:
Lab-based bottle treatability studies helped determine which chemicals could be successfully injected as a gas to support perchlorate and nitrate biodegradation in soil. Hydrogen proved to be the most promising after studying various electron donors, including hydrogen, propane, ethyl acetate, and 1-hexene

BOTTOM LEFT: *Components of the GEDIT test site include (from left to right) the control panel, field trailer, liquefied petroleum gas, hydrogen, carbon dioxide, and liquid nitrogen.*

Grand Prize - Design

San Juan-Chama Drinking Water Treatment Plant

Albuquerque, New Mexico

ENTRANT: Albuquerque Bernalillo County Water Utility Authority (ABCWUA)
ENGINEER-IN-CHARGE: Michael A. Brewer, P.E.

After more than 40 years of planning, the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) opened its 92 million gallon per day (MGD) San Juan-Chama Drinking Water Treatment Plant in 2008.

The plan was initiated in the 1960s with the City of Albuquerque's purchase of the San Juan-Chama (SJC) water rights. San Juan River tributaries were diverted through a 26-mile tunnel under the continental divide to storage reservoirs in northern New Mexico, releasing the water into the Rio Chama River, a Rio Grande Tributary. By the early 1990s, Albuquerque's aquifer depletion resulted in a plan to access the SJC water rights. As part of the Albuquerque Water Resources Management Strategy, CH2M Hill was selected to deliver and implement a plan to provide Albuquerque with a sustainable water supply system, with subsequent designs to provide solutions for a sustainable water supply through 2060.

The San Juan-Chama Drinking WTP is New Mexico's largest surface water treatment plan and the first that relies on water diverted from the Rio Grande River. The WTP was designed to be 100% self contained, recycling all generated waste streams, and designed to preserve the Albuquerque area's underground aquifer. In its first 12 months of operation, 7 billion gallons were delivered to customers of the ABCWUA – 21% of the region's total consumption.

TOP: *San Juan-Chama Drinking Water Treatment Plant*

BOTTOM: *Flexible, Environmentally-Sensitive Transmission System*

Grand Prize - Design

Richmond's Rapid Sewer Flood Relief

Richmond, Virginia

ENTRANT: Greeley and Hansen, LLC
ENGINEER-IN-CHARGE: Federico Maisch, P.E., BCEE

PHOTO: *Surface evidence of the August 31, 2006 collapse of the Battery Park Trunk Sewer in Richmond, VA, was a 50-foot-wide sinkhole.*

On August 31, 2006, Tropical Storm Enersto battered much of the Mid-Atlantic region of the US. One of the hardest hit areas was Battery Park Trunk in Richmond, Virginia. Under eight feet of standing water, the Battery Park Trunk Sewer (which serves more than 5,000 customers) collapsed. With over 33 million gallons of combined sanitary and storm water flooding 80 acres, more than 240 homes had to be evacuated.

Working closely with the Richmond Department of Public Utilities (DPU), Greeley and Hansen was tasked with: assisting with developing emergency pumping and evacuation plans, conducting hydraulics/hydrologic studies, designing and investigating interim and permanent repairs, directing input from specialized resources, providing construction assistance, conducting update/planning meetings with Richmond engineers, and assisting the City of Richmond with coordination of governmental entities.

The trunk sewer had collapsed under a closed municipal landfill, which exacerbated the potential land and water contamination. Because repairing the sewer risked even further contamination, Greeley and Hansen determined a new trunk sewer alignment.

The project included bypass pumping to control flooding, sewer-tunnel blockage investigations, temporary relief solutions, coordination to receive state and federal grant funding, and design and construction of a 3,500-ft. replacement tunnel that became functional 12 months after the disaster.

Grand Prize - Environmental Sustainability

Marco Island Aquifer Storage and Recovery System

East Naples, Florida

ENTRANT: ENTRIX, Inc.
ENGINEER-IN-CHARGE: Lloyd E. Horvath, P.E.

ENTRIX worked with the City of Marco Island, Florida, to develop an Aquifer Storage and Recovery (ASR) project that has become the fundamental source of fresh water for the City during extended dry periods. ASR is a relatively new water management tool whereby underground aquifers are used as reservoirs to store excess water that is available only during certain seasonal periods or withdrawn for use during dry periods. ASR can provide water storage at costs far lower than traditional surface storage methods such as reservoirs.

This innovative Marco Island ASR Project was implemented initially under an alternative water supply grant from the South Florida Water Management District and expanded over a period of several years to produce water at up to 10 million gallons per day capacity. The system can provide 1.5 billion gallons of recoverable fresh water from an aquifer that formerly contained highly brackish, non-potable water. ENTRIX began work on the Marco Island facility in 1996, with a major expansion in 2000.

Regulatory authorities recently granted an operating permit for the system of seven wells in 2009. This project is the first in the world to efficiently store fresh water in a highly brackish aquifer and obtain high efficiency recovery, demonstrates how to build a low cost sustainable supply using a resource available only seasonally, and is a model that is applicable throughout the world to help solve water shortages.

TOP: *Area and features of the Project Site - The figure shows important freshwater related features of the project. The lakes shown are abandoned rock quarries beside a major regional drainage canal. There is a salinity control/discharge structure where shown, that prevents tidal water from moving up the canal during periods of low flow. The lakes serve as the point of intake for fresh water and there is an interconnect between the canal and the lakes where shown on the photo. Fresh water is pumped from the lakes and sent to the island for treatment by lime softening. During the dry season there is very little or no water flowing in the canal and, without ASR, fresh water availability from the lakes is limited. During the wet season, water enters the lakes from the canal interconnect at the north and it flows southward to the intake.*

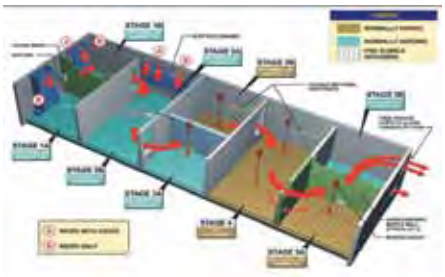
BOTTOM: *The wet season flow conditions of the drainage canal at the salinity control structure. All the freshwater discharge is lost to tide. The high discharges are also not healthy for the estuary located just downstream from this location.*

Grand Prize - Operations/Management

Blue Plains AWWTP Nitrogen Removal Program

Washington, DC

ENTRANT: District of Columbia Water and Sewer Authority
ENGINEER-IN-CHARGE: Walter Bailey, P.E., BCEE



Eight million people live within the boundaries of the Chesapeake Bay estuary watershed, encompassing six states and the District of Columbia. This has resulted in large nutrient loads to the bay, leading to a decline in water quality. Each state receives nutrient allocations that limit loads from point and non point sources.

Developed by the District of Columbia Water and Sewer Authority (DCWASA), the Blue Plains Advanced Wastewater Treatment Plant Nitrogen Removal Program pursues a multi-faceted approach to meet and exceed nutrient removal goals established for the Plant and positions itself to attain stricter anticipated limits in the future.

The Blue Plains AWWTP is the largest advanced wastewater treatment plaint in the world, with a capacity of 370 million gallons per day. It is the only facility of its size with a deep tank (33 feet) nitrification/denitrification system and that removes nitrogen and phosporus.

The Nutrient Removal Program integrated ongoing initiatives into one consolidated program, allowing the plant to be the first to meet or exceed nutrient removal goals set by the Chesapeake Bay Program. The Program greatly expanded the knowledge regarding simultaneous removal of nitrogen and phosphorus levels, which process models had previously indicated was not possible due to nutrient limitations.

TOP: *Nitrification/Denitrification Optimized Configuration*

BOTTOM: *Pristine facility attracts wildlife*

Grand Prize - Planning

Regional Optimization Master Plan (ROMP)

Pima County, Arizona

ENTRANT: Greeley and Hansen, LLC
ENGINEER-IN-CHARGE: Jerry C. Bish, P.E., BCEE

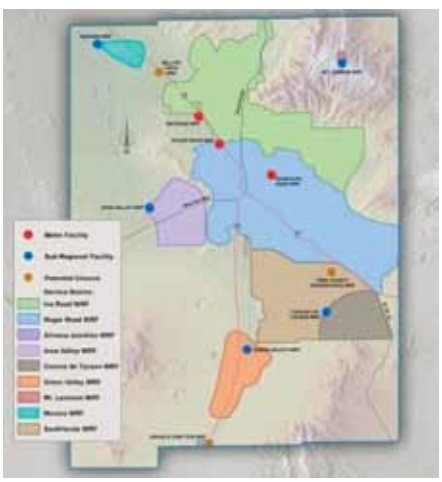


PHOTO: *Pima County Regional Wastewater Reclamation Department (PCRWRD) infrastructure includes two major water reclamation plants and nine satellite facilities, covering a service area of over 2,000 sq. miles.*

Pima County Regional Wastewater Reclamation Department (PCRWRD), a system spanning nearly 500 sq. miles includes two major water reclamation plants, nine satellite facilities, 3,300 miles of sewer pipelines, 66,000 manholes, and 34 pumps. PCRWRD, partnered with Greeley and Hansen, developed a comprehensive, long-term Regional Optimization Master Plan (ROMP), a pro-active strategic plan for upgrading its aging wastewater treatment and conveyance system to address stringent future regulatory requirements and expected continued growth.

Several key goals of ROMP include: meeting permit requirements mandated by the Arizona Department of Environmental Quality for reduced nitrogen and ammonia concentrations in effluent discharged to the Santa Cruz River; developing upgraded treatment process that optimize the handling, treatment, and reuse of biosolids and biogas; integrating issues and concerns of the multiple stakeholders impacted by wastewater services; and providing a financial and cost recovery plan favorable to rate payers.

ROMP outlines a comprehensive, long-range program for upgrading and expanding existing PCRWRD treatment and conveyance facilities. The environmental benefits include improving effluent water quality for use as reclaimed water within the community; enhancing the riparian habitat along the Santa Cruz River; providing effective system-wide odor control; and creating space for future expansion of county recreational facilities.

Grand Prize - Small Projects

Colorado Radionuclide Abatement and Disposal Strategy (CO-RADS)

Denver, Colorado

ENTRANT: Malcolm Pirnie, Inc.
ENGINEER-IN-CHARGE: Jason M. Kerstiens, P.E.

PHOTO: *Among the problems identified in the CO-RADS systems were improper handling of water treatment plant wastes which in some cases contained elevated levels of radionuclides.*

The Water Quality Control Division (WQCD) of the Colorado Department of Public Health and Environment (CDPHE) has launched the Colorado Radionuclide Abatement and Disposal Strategy. CO-RADS is a multi-year, multi-phase project to comprehensively evaluate radionuclide compliance of water systems. Malcolm Pirnie provided its technical expertise by way of bench and pilot studies, process design, health physics, waste handling, and utility operations and management. A primary concern was the management of radioactive residuals generated from treatment processes.

With over 40 public water systems in Colorado affected by naturally occurring radionuclides, mostly rural communities dependent upon groundwater supplies, helping the communities meet the Federal Radionuclides Rule requirements was a monumental task. WQCD recognized that many lacked the technical and financial capacity to remove and manage radioactive material and were in violation of the new regulations.

Assisted by researchers at the Colorado School of Mines, Malcolm Pirnie and WQCD provided a valuable service for 33 affected small water systems that decided to participate in the project. Each water system was provided with a sound engineering evaluation to help them comply with the Radionuclides Rule free of charge, information to help reduce the impacts of radioactive treatment residuals, and tools to support the successful application for funding, including a detailed CO-RADS planning report.

Grand Prize - Research

The National Initiative for the Chesapeake Bay Clean-up Inspires the Development of a Sustainable Compact State of the Art Wastewater Purification Technology

Washington, DC

ENTRANT: District of Columbia Water and Sewer Authority (DCWASA) and AECOM Technology Corporation
ENGINEER-IN-CHARGE: Walter Bailey, P.E., BCEE

At the forefront of efforts to protect the Chesapeake Bay from the impacts of excess nutrient discharges, DC Water and Sewer Authority (DCWASA) sought out the most cost-effective and reliable process for aggressive nutrient removal. With the assistance of AECOM whose services included concept development, planning, design, pilot commissioning and startup, operations, laboratory analysis and monitoring, data analysis, full-scale concept design, cost estimating, process development, and preparing technical papers and presentations that document effective design and operating guidelines for the successful implementation of this technology; DCWASA determined that there was adequate existing information on design criteria and performance on all of the alternatives with the exception of the Post-Denitrification MBBR process. Specifically, insufficient data existed on to achieve nitrogen discharge limits of 3 mg/L.

MBBR (Moving Bed Biofilm Reactor) process is an innovative European technology that offers mechanical simplicity, ease of maintenance, and reported reliable performance even under cold weather conditions, which are the most challenging for nutrient removal. The cost effectiveness and reliability of this process was evaluated by operating a pilot scale denitrifying facility at Blue Plains for six months to examine its performance over a range of design and operating conditions.

Due to the joint venture and efforts of AECOM and DCWASA, MBBR technology has emerged as one of the most compact and cost-effective denitrification technologies in the industry today.

TOP: *In the MBBR system, the biomass is primarily supported on the inside of plastic media or biofilm carriers. These pieces of media or carriers are suspended and thoroughly mixed throughout the process. Many different sizes and shapes of carriers have been developed as shown in this picture. The items on the bottom row of the picture show what the Hydroxyl 515®plastic media looked like when a healthy biofilm layer was developed.*

BOTTOM: *The entire MBBR pilot unit was housed inside a trailer that was located alongside the nitrification/denitrification effluent channel that ultimately flows to the final dual media filters. Infilco Degremont Inc (IDI) MBBR media was selected for this applied research pilot.*

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AECOM is honored to be recognized in conjunction with the D.C. Water and Sewer Authority with a Grand Prize in the Research category of the 2010 Excellence in Environmental Engineering. We congratulate all the award recipients and honorees.

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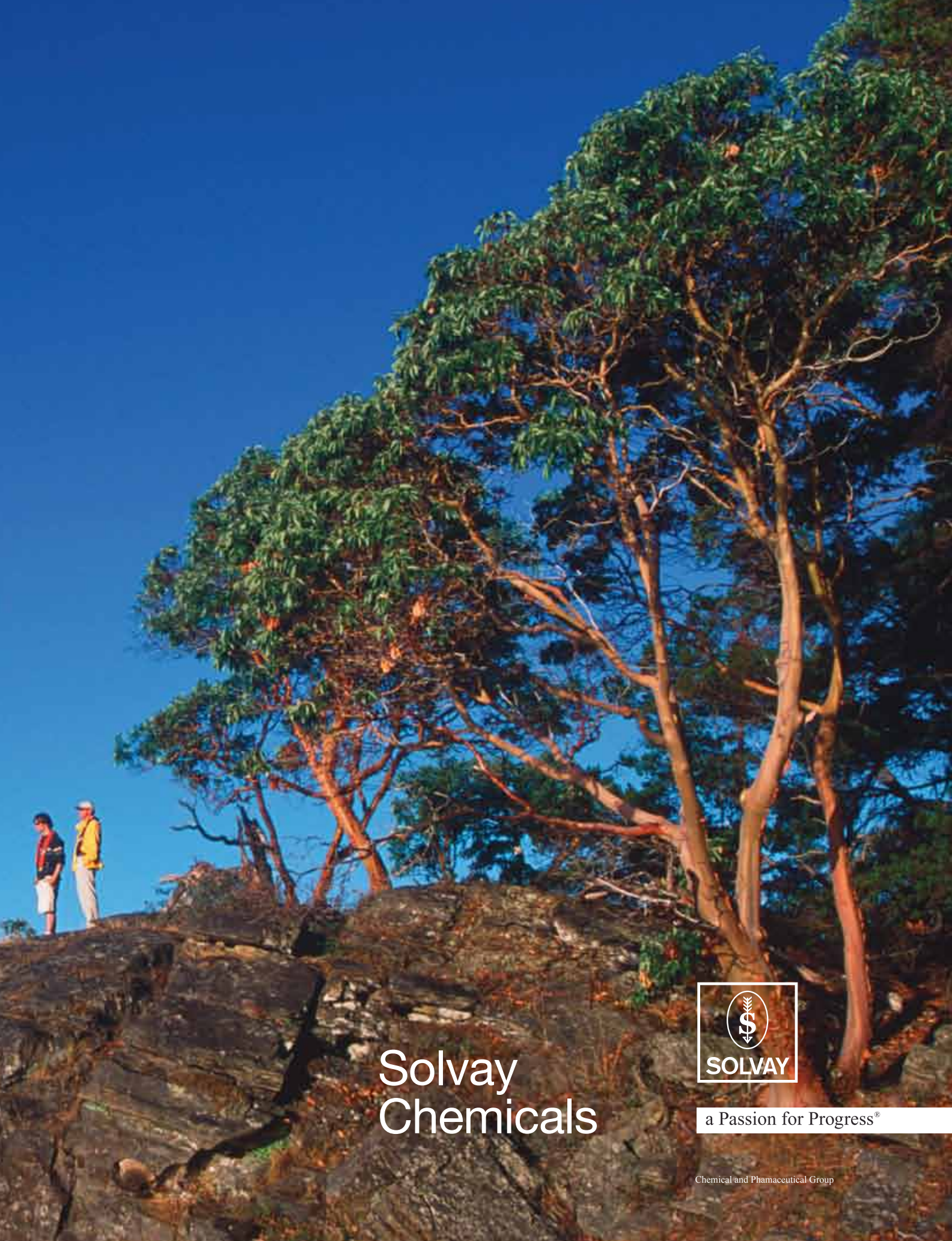

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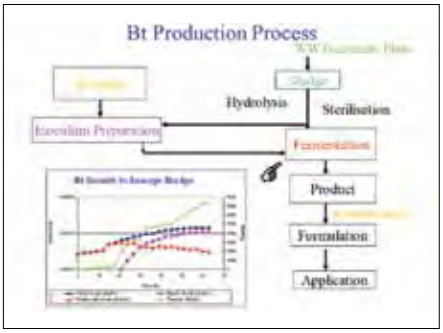
Grand Prize - University Research

Value-Added Products through Bioconversion of Wastewater and Wastewater Sludge

Quebec, Canada

ENTRANT: Institut National de la Recherche Scientifique, Centre Eau, Terre & Environnement (INRS-ETE)
ENGINEER-IN-CHARGE: Dr. R.D. Tyagi/Rao Y. Surampalli, Ph.D., P.E., BCEE



Municipal sewage sludge processing, utilization, and disposal are among the most difficult and expensive operations conducted by municipalities. The US, alone, produces approximately 16,900 tons which must be managed in an environmentally-acceptable way. In addition to the traditional agricultural application of biosolids and composting, recent trends in value-addition has seen another dimension where it is utilized for production of construction aggregates, adsorbents, fuels, biotechnical products, animal feed, secondary metabolites, and electricity.

There is an increasing demand for biological products such as biosurfactant, bioplastics, bioflocculants, biopesticides, bioferterlizers/bioinoculants, and enzymes. Economy is generally problematic in the biotechnological production process. Success of biological production is reliant on developing an economical process using cheaper raw materials like renewal resources, which account for 30-40% of the overall cost depending on the scale of production. Sludge can replace the expensive raw material to generate biological products and, thus, reducing the cost of production. This research successfully developed marketable technologies for the production of value-added productions using wastewater and wastewater sludge as raw material. The cost of production is 40 to 60% lower than the conventional process. This research also provides a new alternative method for sludge disposal.

TOP: *Bt Production Processes*

BOTTOM: *Production of Bt in Activated Sludge*

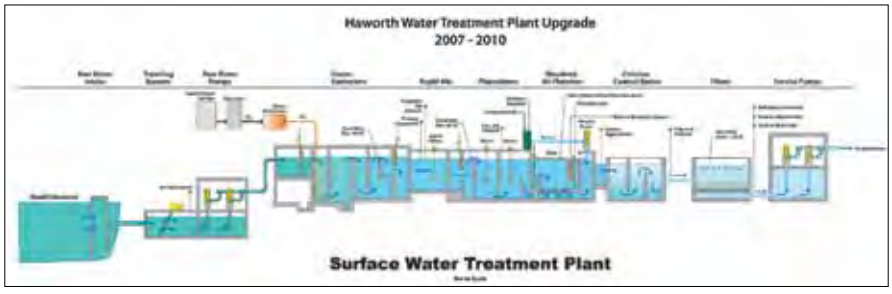
Honor Award - Design

Haworth Water Treatment Plant Upgrade

Haworth, New Jersey

ENTRANT: CDM
ENGINEER-IN-CHARGE: Peter Tunnicliffe, P.E., DBIA, BCEE

CDM partnered with United Water New Jersey to implement the Haworth water treatment plant upgrade. As design-builder, CDM designed and constructed the largest high-rate dissolved air flotation (DAF) system in the United States, an ozone treatment process, disinfection facilities, and residuals handling and treatment processes in only 21 months – half the time conventional design and construction would require. In addition to highly efficient DAF and ozone pretreatment, the firm employed energy saving measures throughout the project, including materials recycling, energy-efficient lighting, and heat conservation. The project was delivered ahead of schedule and under budget.



RIGHT: *Innovative water treatment process improves water quality: Faced with new, stringent drinking water regulations and growing customer needs, United Water New Jersey (UWNJ) upgraded its Haworth water treatment plant. The upgrade includes a highly efficient ozone treatment process, high-rate dissolved air flotation (DAF), new disinfection facilities, and new residuals handling and treatment processes.*

RIGHT: *High-rate DAF's small footprint conserves woodland: High-rate DAF requires one-eighth the process tank volume needed for a traditional sedimentation clarification process, saving 12 acres of pristine woodland.*

UNIVERSITY RESEARCH GRAND PRIZE

VALUE-ADDED PRODUCTS THROUGH BIOCONVERSION OF WASTEWATER AND WASTEWATER SLUDGE

ENGINEERS IN CHARGE:
Prof. R.D. Tyagi, Ph.D., Canada Research Chair; R.Y. Surampalli, Ph.D. P.E., BCEE

Prof. R.D. Tyagi, Ph.D., Canada Research Chair;
INRS-ETE, 490, rue de la Couronne
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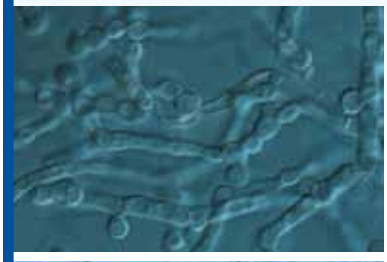
Phone: 1 418 654-2617 Fax: 1 418 654-2600
Email: tyagi@ete.inrs.ca

Dr. Rao Y. Surampalli
US EPA, PO Box 172141,
Kansas City, KS 66117, USA
Phone: 1 913 551-7453
Fax: 1 913 551 9453

Prof. Rajeshwar Dayal Tyagi (INRS-ETE) is carrying out a scientific project in partnership with Dr. Rao Y. Surampalli (US EPA). This Canada–USA collaboration profits from the expertise of INRS researchers in the field of industrial and municipal waste reclamation for value added products production. A variety of biobased products with plenty of markets to conquer: biopesticides, biocontrol agent (*B. thuringiensis sp., Trichoderma sp.*), enzymes (proteases, oxidases), bioplastics (e.g. PHB), biofuels (e.g. ethanol) and biofertilizers (e.g. *Rhizobium sp.*).

The bioproducts are destined to be used in Canada and the USA. In the end, biotechnological processes will be implemented at the industrial level. The project's benefits are threefold:

- a significant contribution to sustainable waste management;
- the production of alternative value added products;
- a reduction in greenhouse gas emissions by recycling the carbon contained in wastes.



Top: Trichoderma-biocontrol agent; **right:** Pilot plant with 15L, 150L and 2000L fermentors for bioconversion of wastewater and wastewater sludge to value added products.

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Honor Award - Design

Pine Creek Wastewater Treatment Plant

Calgary, Canada

ENTRANT: CH2M Hill
ENGINEER-IN-CHARGE: J. Warren Switzer, P.Eng.

Calgary (Canada) has experienced explosive population growth – from just under a million in 2006 with over 1.2 million residents expected by 2016, placing significant pressure on infrastructure and a dramatic increase in wastewater flow and loads. The Pine Creek Wastewater Treatment Facility will meet the City's immediate needs and provide for future expansion. Working closely with CH2M Hill, the Pine Creek project has been planned, designed, and implemented using an integrated approach to sustainability considering aesthetics, environmental design, economic viability, and the diverse interests of multiple stakeholders.

TOP: *Pine Creek is situated on the sensitive Bow River*

BOTTOM: *Pine Creek Wastewater Plant*

Honor Award - Design

Hangtown Creek Water Reclamation Facility – 2005 Facility Improvements

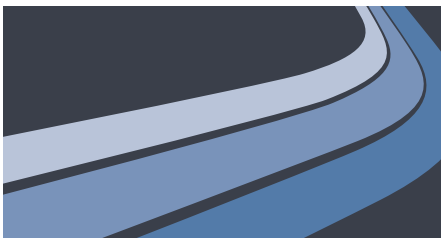
Placerville, California

ENTRANT: Owen Psomas
ENGINEER-IN-CHARGE: Webster J. Owen, Jr., P.E.

Owen Psomas (formerly Owen Engineering & Management Consultants, Inc.) was selected by the City of Placerville as program manager to provide planning, permitting, engineering, design, construction management, inspection, and operations assistance services for a $45 million comprehensive upgrade of Hangtown Creek Water Reclamation Facility (HCWRF). The 2.3 mgd facility, located in the Sierra foothills of Northern California, discharges tertiary treated effluent to adjacent Hangtown Creek. In addition to significantly improving the quality of the effluent, the facilities were engineered to reduce operating costs. Electrical Power, chemical usage and solids disposal costs have been reduced by 34%, saving City customers approximately $200,000 per year.

TOP: *Completed Hangtown Creek Water Reclamation Facility - June 2009*

BOTTOM: *Operations Control Building*



Honor Award - Environmental Sustainability

The Inland Feeder Program

Los Angeles, California

Entrant: Metropolitan Water District of Southern California

Engineer-in-Charge: John V. Bednarski, P.E

The Inland Feeder Program was implemented by the Metropolitan Water District of Southern California (MWDSC) as a way to ensure water supply reliability to the nearly 19 million residents within a 5,200 sq. mile service area. MWDSC is a regional supplier of supplemental water for Southern California and can deliver over 2 billion gallons per day of treated drinking water to its 26 member agencies; who in turn retail this water to individual customers or sub-agencies. Metropolitan provided engineering design support and overall program management activities for the $1.2 billion feeder program.

TOP: *Diamond Valley Lake: The terminus of the Inland Feeder is Diamond Valley Lake, located south of the San Andreas fault, this reservoir can store up to 800,000 acre feet of water, enough to supply the region for up to 6 months in the event of an earthquake severing the larger northern aqueducts.*

BOTTOM: *Project Map: The Inland Feeder program spans 44 miles in a generally north-south direction from Devil Canyon Afterbay in San Bernardino to its terminus in the south near Diamond Valley Lake. The alignment utilizes three tunnel segments, totaling 18 miles, with the remaining portions of the Feeder consisting of buried pipeline.*

Honor Award - Environmental Sustainability

Rothenbach Park Landfill Site Reutilization

Sarasota, Florida

ENTRANT: PBS&J
ENGINEER-IN-CHARGE: R. Michael Peel, P.E.

Since May 1997, PBS&J has been involved in nearly every facet of transforming the Bee Ridge Landfill in Sarasota County, Florida, into the passive, public Rothenbach Park. As the engineer-of-record for the landfill closure and the park, PBS&J provided project management, planning, survey, environmental assessment, drainage design, utility design, landscape/irrigation design, extensive permitting assistance, bidding, and construction administration/inspection services. The project presented significant challenges because it was not only located on a closed landfill, but also adjacent to environmentally sensitive areas.

TOP: *Welcome to Rothenbach Park in Sarasota County, Florida.*

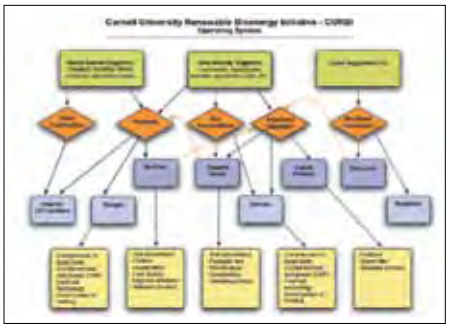
BOTTOM: *On the surface, Rothenbach Park doesn't look much different than other passive parks in the area. But it's really a whole lot more interesting. It was constructed on the county's closed and capped Bee Ridge Landfill and is a shining example of how simplicity can create sustainability.*

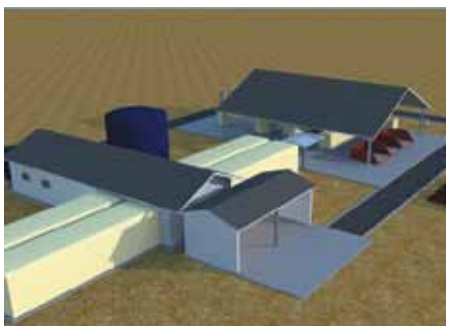
Honor Award - Environmental Sustainability

Cornell University Renewable Bioenergy Initiative

Ithaca, New York

ENTRANT: Stearns & Wheler GHD
ENGINEER-IN-CHARGE: Wayne E. McFarland, P.E., BCEE





The Cornell University Renewable Bioenergy Initiative (CURBI) was developed with the goal of reducing campus greenhouse gas emissions and identifying beneficial uses for approximately 30,000 tons per year of biomass produced within Cornell University. Stearns & Wheler, GHD, completed the study that demonstrates how a combination of leading-edge technologies can provide positive cash flow, reduce carbon footprint, and allow the offset of fossil fuel-based energy with renewable bioenergy. The primary benefit of the CURBI project was to establish a "renewable energy platform" which could be used to further research, teaching, and extension/outreach activities related to greenhouse gas reduction and renewable energy production from biomass.

TOP: *CURBI Flow Chart: Biomass-to-energy processes will convert 30,000 tons per year of biomass into energy and useful byproducts, while reducing the University's carbon footprint by over 9,500 metric tons of carbon dioxide equivalent per year.*

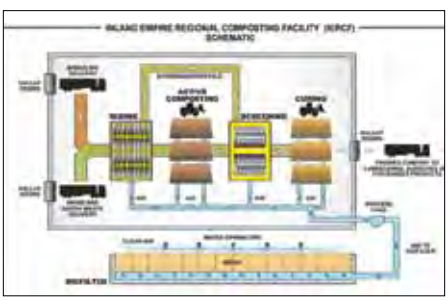
BOTTOM: *Rendering: The CURBI integrated system will be located near greenhouses and agricultural resources to maximize use of renewable energy, and minimize transportation of feedstocks.*

Honor Award - Operations/Management

IERCA - A Regional, Cost-Effective Approach to Sustainable Organics Management

Ithaca, New York

ENTRANT: Sanitation Districts of Los Angeles County
ENGINEER-IN-CHARGE: Stephen R. Maguin, P.E., BCEE



The Inland Empire Utilities Agency (IEUA) and the Sanitations Districts of Los Angeles County (SDLAC) formed the Inland Empire Regional Composting Authority (IERCA) to address southern California's challenges with biosolids management. A 413,000 sq. ft. vacant warehouse was identified in Rancho Cucamonga as an ideal location for the Inland Empire Regional Composting Facility (IERCF) – the largest completely enclosed, aerated static pile composting facility in the US. Constructed between 2003 and 2007, the facility can process 150,000 tons of biosolids and 60,000 tons of wood/green waste per year. The finished product, SoilPro Compost, is distributed and sold for a variety of direct and retail uses.

TOP: *Schematic showing the processes of the IERCF*

BOTTOM: *Logo for branding and marketing of the finished product.*

Honor Award - Planning

US 411 Connector Environmental Impact Statement and Supporting Engineering

Bartow County, Georgia

ENTRANT: Jordan, Jones & Goulding, Inc.
ENGINEER-IN-CHARGE: Ken Anderson, P.E.

Jordan, Jones & Goulding, Inc. (JJG) was selected by the Georgia Department of Transportation (GDOT) to complete a Supplemental Environmental Impact Statement (SEIS) for a new location roadway to provide a direct link from the US 411 interchange with SR 3/US 41, eastward to Interstate (I)-75 in Bartow County, Georgia – the US 411 Connector. JJG managed the project by preparing a NEPA Draft and Final SEIS (including all engineering and environmental studies and surveys), a public involvement plan (including leading public and community outreach meetings), traffic analysis, concept alignments, and detailed project alternatives.

TOP: *US 411 Rendering: The US 411 Connector public involvement process included numerous visualization techniques, such as this still rendering (for all alternatives) and a full-motion video "drive-through" simulation of the preferred alternative.*

TOP: *Preliminary Concepts: The location of the US 411 Connector corridor began by identifying a total of nine engineering concept alignments that represented all the basic connection possibilities of connecting US 411 West with I-75 in the study area.*

Honor Award - Research

Microbial Risk Assessment for Recreational Use of the Chicago Area Waterways

Chicago, Illinois

ENTRANT: Geosyntec Consultants
ENGINEER-IN-CHARGE: Chriso Petropoulou, Ph.D., P.E., BCEE

The Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) retained Geosyntec Consultants (Geosyntec) and its subcontractors to conduct a microbial risk assessment (MRA) of the Chicago Area Waterway System (CAWS). The main objective of the MRA study was to evaluate the human health impacts on recreational users, of continuing the current practice of not disinfecting the effluents from the District's North Side, Stickney and Calumet Water Reclamation Plants (WRPs) versus initiating effluent disinfection. Dry and wet weather samples were collected within the recreational season and analyzed for indicator and pathogen bacteria, protozoa and viruses. The results were integrated in a probabilistic MRA to estimate illness rates during incidental exposure in the CAWS and the need of WRP effluent disinfection.

TOP: *The Chicago Area Waterway is a manmade channel used for draining of urban stormwater and the conveyance of secondary treated effluent from MWRDGC's three larges water reclamation plants: North Side, Stickney, and Calumet*

BOTTOM: *CWS Microbial Risk Assessment Segments*

Honor Award - Small Projects

Downtown Scottsdale Booster Station

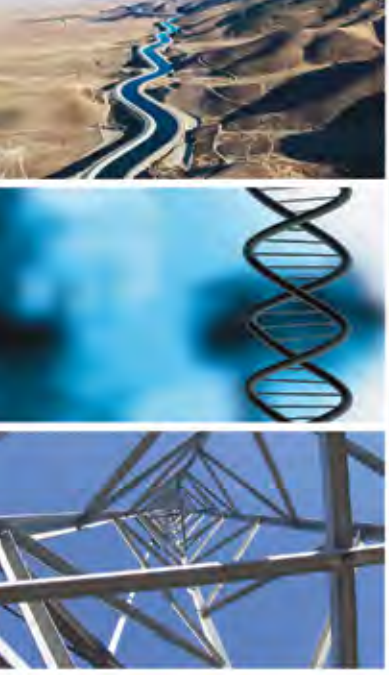
Scottsdale, Arizona

ENTRANT: GHD, Inc.
ENGINEER-IN-CHARGE: Peter Chan, P.E.

The Downtown Scottsdale Booster Station is an in-line pumping facility constructed within the City's Arts District to meet the growing water demands of the Downtown revitalization program. To compliment its surrounding community, the project's design integrates engineering functionality with the aesthetics of art. GHD's Peter Chan served as the Prime Design Consultant on this project and provided services which included public outreach, topography survey, steady state and transient modeling, master planning, booster station and waterline design, water feature pump design, project management, and post design services.

TOP: *Aerial View of Site: This vantage point is from above Marshall Way. Indian School Rd. is in the background. This is the design team's favorite project photo. It shows the existing Horseshoe Falls, the new community park, and booster station relative to one another. Only the concrete sidewalks along the roads and water features are hardscape, the remainder of the site is covered with pervious decomposed granite to eliminate the need for drainage retention.*

TOP: *Horseshoe Falls and Park: This photo clearly illustrates the way the new park and CMU walls incorporate the existing beautiful Horseshoe Falls. The sidewalk, benches, and walls of the new improvements mirror the rounded shape of the existing art feature. The LED lighting can be seen in the background, while plantings and trees frame the site.*



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Volume 11, Spring 2010

Environmental Engineer: Applied Research and Practice

INSTRUCTIONS TO CONTRIBUTORS

PURPOSE AND SCOPE

Environmental Engineer: Applied Research and Practice, is a peer-reviewed journal focused on practical research and useful case studies related to the multi-disciplinary field of environmental engineering. The journal strives to publish useful papers emphasizing technical, real-world detail. Practical reports, interesting designs and evaluations of engineering processes and systems are examples of appropriate topics. Papers relating to all environmental engineering specialties will be considered.

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All papers submitted to the journal are subject to critical peer review by three referees, who have special expertise in a particular subject. The Editor will have final authority over a paper's suitability for publication.

CATEGORIES

Papers may be submitted in the following areas:

Applied Research

Original work presented with careful attention to objectives, experimental design, objective data analysis, and reference to the literature. Practical implications should be discussed.

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Broad coverage of an environmental engineering application or a related practice with critical summary of other investigators' or practitioners' work.

Practical Notes

Novel methods that the author(s) have found to be sufficiently successful and worth recommending.

Case Studies

Recently completed projects or studies in progress that emphasize novel approaches or significant results.

Design/Operation

Conceptual or physical design or operation of engineering systems based on new models or techniques.

Management

Papers describing novel approaches to problems in environmental management, or to the global, sustainability or business asects of environmental engineering.

ABSTRACT

An abstract of up to 200 words should be provided, including a statement of the problem, method of study, results, and conclusions. References, tables, and figures should not be cited in the abstract. Up to six key words or terms should be included for use by referencing sources.

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USE OF PILOT-SCALE BATCH REACTORS TO EXPLORE IMPROVEMENTS IN BIOLOGICAL PHOSPHORUS REMOVAL AT FULL-SCALE TREATMENT PLANTS

John J. Wang, Ph.D., P.E.,[1] and Paul L. Bishop, Ph.D., P.E., BCEE[2]

ABSTRACT

The aeration tanks at two Ohio wastewater treatment plants (Mill Creek and Upper Mill Creek) were investigated to improve phosphorus (P) removal. Although these plants were operated in modes conducive to biological P removal (BPR) and had high P removal efficiencies, they still had difficulty in consistently meeting their P discharge targets. Pilot-Scale Batch Reactors (PSBR's) were installed and fed mixed liquor from the head end of the aeration tanks to investigate the influence of anaerobic/anoxic and aerobic zones on BPR. The PSBR's were useful in investigating the influence of anaerobic/anoxic and aerobic zones on BPR. The results were used to recommend process modifications to improve BPR.

BACKGROUND AND PURPOSE

Historically, phosphorus removal technology has relied on chemical precipitation by the addition of iron or aluminum salts. However, in recent years more emphasis has been placed on biological phosphorus removal (BPR) followed by chemical precipitation only if necessary to meet discharge limits (Carrera et al. 2001).

BPR from wastewater can be achieved in two ways: stoichiometric coupling to microbial growth or enhanced storage in the biomass as polyphosphate (poly-P). The latter was formerly called "luxury uptake" and is the key mechanism in enhanced biological phosphorus removal (EBPR) (Carucci et al. 1999; Jeon et al. 2001a, b; Mino et al. 1998; Seviour et al. 2003). EBPR has been proved to be the most economical and sustainable method for phosphorus removal (Keller et al. 2002; Pijuan et al. 2004). The EBPR process is primarily characterized by circulation of activated sludge through anaerobic and aerobic phases, coupled with the introduction of influent wastewater into the anaerobic phase. By this anaerobic/aerobic configuration, microorganisms that accumulate poly-P and thus have high phosphorus content, are selected and grow to dominance in the process. High phosphate removal efficiency can be achieved by withdrawing the excess sludge with high phosphorus content (Mino et al. 1998).

The Pilot Scale Batch Reactors (PSBR's) used in this study were modified based on the widely used Sequencing Batch Reactor (SBR) process. The SBR process includes a provision for recycled biomass, as well as allowance for feed time, react time, settling time, and effluent withdrawal time. The PSBR's employed here were fed mixed liquor, had very short fill and withdrawal times, and did not provide for settling.

SBR is widely used in nitrogen and phosphorus removal research (Randall et al. 1997; Baetens et al. 1999; Nielsen et al. 1999; Dassanayake and Irvine 2001; Hood and Randall 2001; Jeon et al. 2001a, b; Zeng et al. 2003; Chen et al. 2004). For instance, Oa and Choi (1997) studied phosphorus removal from nightsoil using an SBR. They found that phosphorus could be removed 36% in the cellular form, 42% by chemical precipitation, and 5% by adsorption. Biological phosphorus removal could be increased by increasing the anaerobic period. The nitrogen removal potential of poly-P accumulalting organisms (PAOs) under anoxic conditions was evaluated using a laboratory scale SBR fed with synthetic wastewater and operated in a sequence of anaerobic, anoxic and aerobic periods (Artan et al. 1998). The phosphate uptake rate under anoxic conditions was lower than that under aerobic conditions. However, in the presence of an external substrate such as glucose or acetate, the fate of phosphate was dependent on the substrate type. Phosphate release occurred in the presence of nitrate as long as acetate was present, and glucose did not cause any phosphate release.

Hood and Randall (2001) conducted anaerobic/aerobic batch experiments with a variety of volatile fatty acids (VFAs) and amino acids on two sequencing batch reactor populations displaying enhanced biological phosphorus removal. Jeon et al. (2001b) evaluated the effect of pH on phosphorus removal by repeating operation of a sequencing batch reactor supplied with acetate as a sole carbon source.

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[2] Department of Civil and Environmental Engineering, PO Box 210071, University of Cincinnati, Cincinnati, OH 45221-0071, U.S.A.

Figure 1
Schematic of the Pilot-Scale Batch Reactor

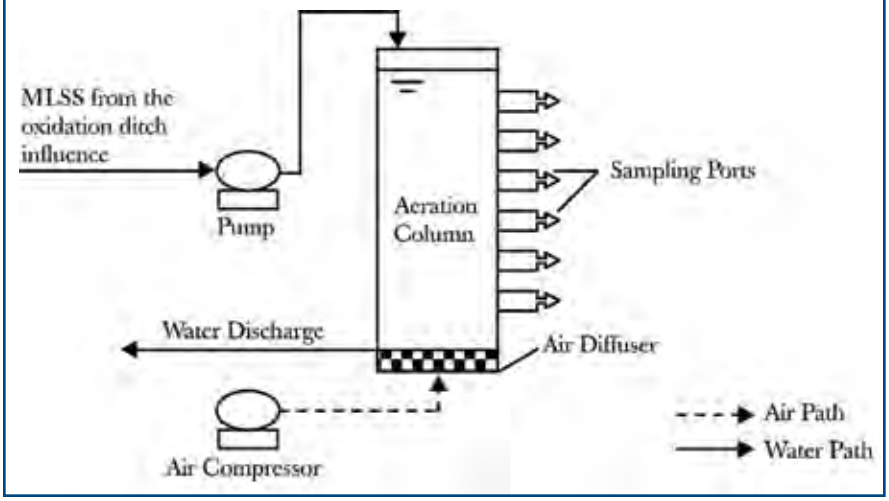


Figure 2
Photograph of the PSBR at the Mill Creek Treatment Plant

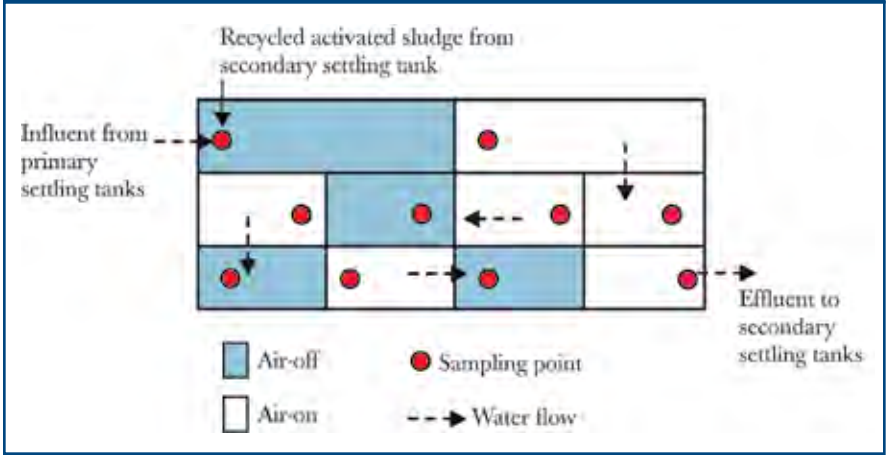
The purpose of this study was to explore improvements in biological phosphorus removal at two full-scale treatment plants. Pilot scale batch reactors were used to investigate the influence of anaerobic/anoxic and aerobic zones on BPR efficiency.

PILOT-SCALE BATCH REACTOR (PSBR)

The PSBR's employed in this study were fed mixed liquor from the head end of the aeration tank and the reaction period was equal to the nominal retention time of the plant aeration tank. After each reaction period, the reactor discharged its entire volume and was refilled with mixed liquor. Because the reactor was fed mixed liquor from the head of the aeration tank, it mimicked the operation of a plug flow aeration tank with spatial sequences occurring in the aeration tank, mimicked by temporal sequences in the PSBR. An advantage of the PSBR is that the dissolved oxygen conditions (e.g. anaerobic/anoxic, vs aerobic conditions) can be easily manipulated and the short term effects of these conditions can be readily measured

The PSBR's consisted of columns nominally 3 meters high and 0.30 meters in diameter (Figure 1). The column height could be varied by adding or removing column segments. The column cross sectional area was 0.067 m^2 and the volume was 0.181 m^3 for a water height of 2.7 meter. The diffuser used in the bottom was a fine pore ceramic disc diffuser and was the same as that used in the full-scale aeration tanks. Although several sampling ports along the column length, only the port, located at one meter from the column bottom, was used in this study to draw samples at various time intervals. A DO probe was placed into the column from the open top and measured the DO level at about 50 cm depth. A pump with a maximum capacity of 22.7 liters/min was used to pump the mixed liquor from the head end of the full-scale aeration tanks into the column. An air compressor was used to supply air at a maximum flow of 56.6 liters/min (120 cubic feet/hour) under 3.0 m water head. A Kings flow meter was used to control the airflow into the column. Based on the column volume, an air flow of approximately 5.7 liters/min (12 cubic feet/hour) was required to achieve the current full-scale aeration level, and thus the air flow meter was chosen to have a maximum capacity of 9.4 liters/min (20 cubic feet/hour) under standard conditions. Temperature and pressure corrections were done using the chart provided with the flow meter to convert the airflow to the standard temperature and pressure. The whole system was placed on a steel cart with four wheels installed underneath to make it movable (Figure 2).

Figure 3
Zones and Sampling Points at the Mill Creek Aeration Tank



MILL CREEK PLANT STUDY

The Metropolitan Sewer District of Greater Cincinnati (MSD) provides wastewater removal and treatment for over 800,000 customers throughout Cincinnati and Hamilton County. The area served includes 33 municipalities and unincorporated areas covering more than 400 square miles. Over 200,000 separate sewer connections tie into the 3,000+ miles of sanitary and combined sewers.

Overview of the Mill Creek Plant

The Mill Creek Wastewater Treatment Plant (WWTP) is the largest of seven major WWTPs operated by Cincinnati MSD. The influent wastewater is composed of 30% industrial wastewater and 70% municipal sewage. The plant was designed with a capacity of 120 million gallon per day (MGD) (454,249 m^3/day) and a peak flow of 300 MGD (1,135,624 m^3/day). The wastewater treatment process consists of primary sedimentation, activated sludge treatment, secondary settling and chlorination. There are six equally sized aeration tanks designed as plug flow reactors, and each tank has three passes. Each pass is 110 m long, 10.5 m wide and 5.5 m deep, with a volume of 18,896 m^3 (5 million gallons). Hydraulic retention time (HRT) in each aeration tank at design flow is 6 hours. The sludge retention time (SRT) is about 5 to 6 days.

Characteristics of the Aeration Tank

Based on the results of an earlier study done by Aman and Bishop (1999), the aeration tanks were operating in an alternating aeration/minimal aeration mode in order to more efficiently use the aeration equipment and to greatly reduce power costs. This operation mode was also predicted to favor the phosphorus removal. The 6 hour HRT was divided into eight sections (from influent to effluent: 1 hr air off, 2 hr air on, 0.5 hr air off, 0.5 hr air on, 0.5 hr air off, 0.5 hr air on, 0.5 hr air off and 0.5 hr air on). Figure 3 shows the sampling points along the water path in the aeration tank. The shaded areas denote anoxic sections and the white areas denote aerobic sections.

Figure 4
DO, pH, COD, and Temperature Profiles for the Mill Creek Aeration Tank

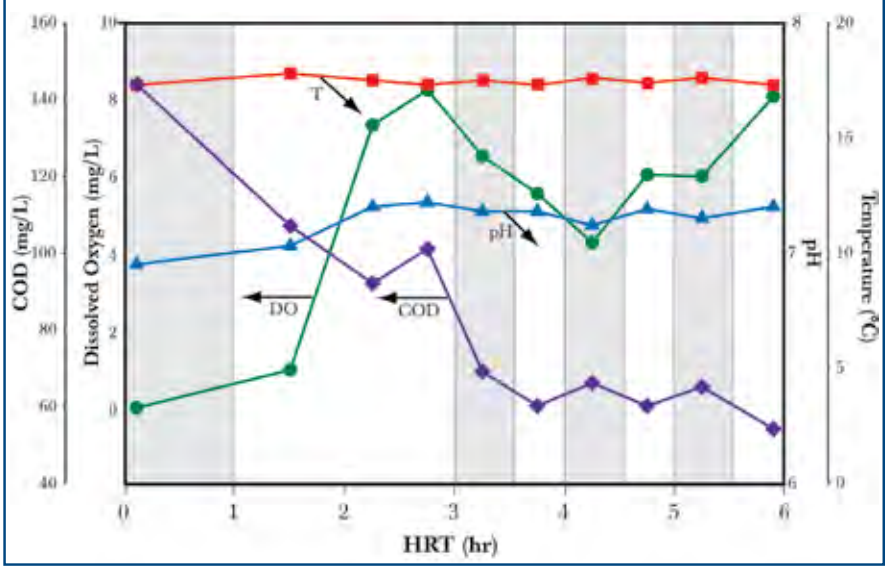


Figure 5
Phosphate and DO Profiles for the Mill Creek Aeration Tank

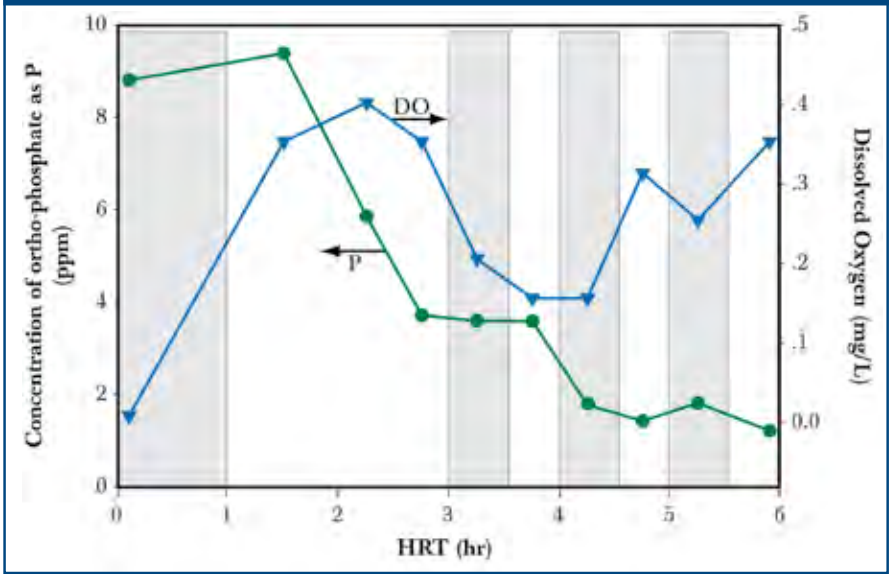


Figure 4 shows the profiles (COD, DO, pH and temperature) along the water path. The data were based on one set of measurements. DO, pH and temperature were measured on site by placing the probes into the aeration basin. The shaded areas stand for the periods with air off. The HRT was 6 hours. Dissolved oxygen was lower than 1 mg/L in the first one hour and was increased to more than 8 mg/L during the first aeration period. COD was reduced from 144 mg/L at influent to 54 mg/L at effluent. Values of pH and temperature changed little, with a slight increase in pH.

Phosphate and DO profiles are illustrated in Figure 5. The P profile indicates that the phosphate concentration increased during the first hour (anaerobic period) and then decreased during the first aeration period. For the second and third anoxic periods, the rate of P decrease slowed down. The phosphate concentration increased a little during the last (forth) anoxic period. The final effluent total

Figure 8
Phosphate and DO Profiles for the Upper Mill Creek Oxidation Ditch

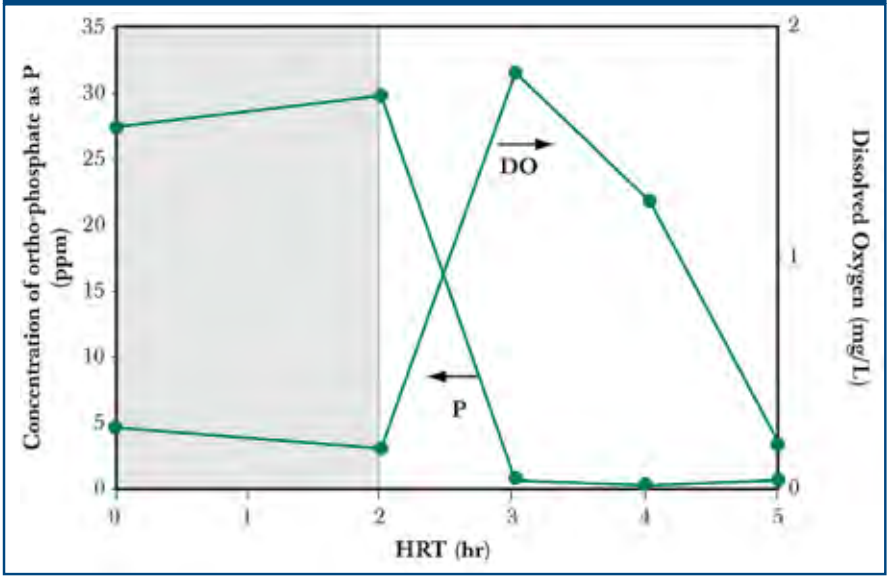
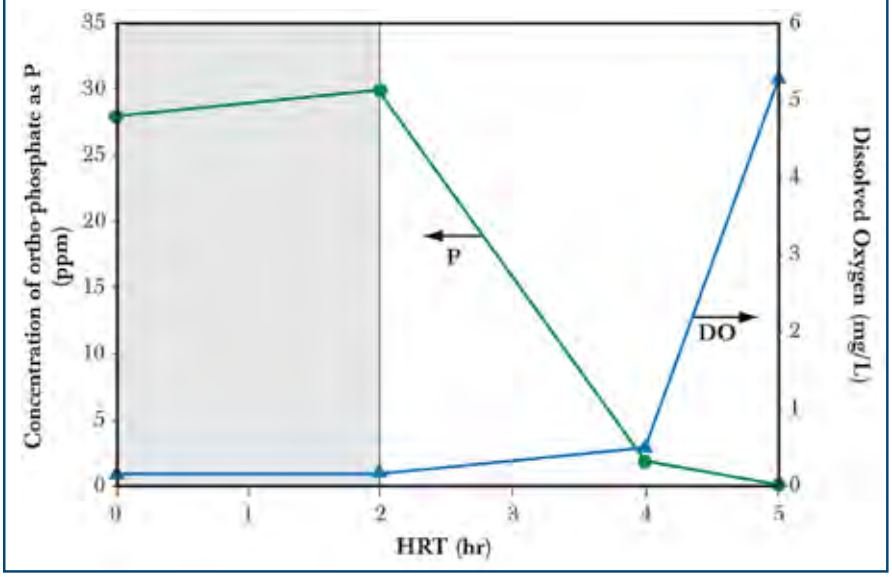


Figure 9
PSBR Phosphate and DO Profiles for the Upper Mill Creek Plant



phosphate concentration was 1.2 ppm and did not meet the typical 1.0 ppm discharge standard, although there was no P standard for this plant when the study was conducted. A possible reason for this could be that the microorganisms did not release much phosphate during the first anaerobic period. Availability of sufficient VFAs could be another reason.

PSBR Study of the Mill Creek Plant

Based on examination of the aeration tank DO and P profiles it was hypothesized that the short duration anaerobic sections might be responsible for the effluent phosphate concentration to be higher than 1 ppm. Therefore, the PSBR was set up to mimic a two hour initial anaerobic period followed by alternating anaerobic-aerobic periods (1 hr air on, 1 hr air off, 1 hr air on and 1 hr air off). The resulting DO and P profiles are illustrated in Figure 6. The data were measured based on one run cycle of the PSBR.

The phosphate concentration increased from 8.79 ppm to 15.33 ppm during the first 2 hr anaerobic period. This increase was much larger than that in the aeration tank (Figure 5, from 8.79 ppm to 9.37 ppm). The P concentration then decreased to 9.11 ppm during the following aerobic section (from 2hr to 3hr). The decreasing rate slowed down during the second anaerobic section and accelerated again when the air compressor was turned on. The effluent P concentration was zero, or at least lower than the IC detection limit of 0.1 mg/L. By simply changing the operation mode (longer anaerobic period), the higher P removal rate (100%) could be achieved, in comparison with the removal rate in full-scale the aeration tank (86%).

It should be noticed that the mixing condition of the PSBR differs from that of the aeration tanks. The PSBR simulates perfect plug flow with zero back mixing whereas the actual aeration tank would have some back mixing. Therefore, the transitions between zones in aeration tanks are less of a step function and less efficient.

The dissolved oxygen concentration decreased quickly to 0.11 mg/L when the air compressor was shut off. There was foam covering the water surface. When the air compressor was turned on, the desired DO level was quickly obtained (less than 5 minutes). The DO profile in Figure 6 appears to be two square pulses, illustrating the quick changes that occurred.

Using a longer aerobic period after the initial anaerobic section could be another option to reduce the P concentration to lower than 1 ppm. In Figure 5, the P concentration decreased from 9.37 ppm at 1.5 hr to 3.7 ppm at 2.75 hr. It is likely that this high reduction rate would continue if a relatively high DO level was maintained. However, the operation depicted in Figure 6 was the better choice in terms of energy cost. In the real world, the operating mode chosen also depends on the original design of the aeration tanks. Alternating air-on, air-off operation can only be practiced when the different air diffusers within the same aeration tank can be controlled separately and the residence time distribution within the aeration tank approximates plug flow.

UPPER MILL CREEK PLANT STUDY

The Butler County Department of Environmental Services provides wastewater services to a growing population of over 100,000 in West Chester, Liberty, Fairfield, Hanover and Ross Townships and operates five wastewater treatment plants with a combined permitted discharge flow of 29 MGD (109,777 m^3/day). The Upper Mill Creek Regional Water Reclamation Facility located in West Chester, Ohio is one of these plants.

Overview of the Upper Mill Creek Plant

The wastewater treatment process contains two bar-screens, one grit chamber, one oxidation ditch and two secondary settling tanks. The current average flow is about 8 MGD (30,283 m^3/day). The influent wastewater includes wastewaters from surrounding restaurants and food processing factories. Therefore, the influent has relatively high phosphorus concentrations.

Ohio EPA has ordered the Upper Mill Creek Plant to meet a phosphorus discharge standard of 1 ppm on a weekly average. At the time of this study, the facility was experiencing inconsistent phosphorus removal. Usually, the effluent phosphorus met the goal during week days, but the situation was worse on weekends because of the different influent flow and raw wastewater characteristics. A pilot study was performed to provide useful information for the upcoming extension of the facility.

Characteristics of the Oxidation Ditch

The Upper Mill Creek facility uses the oxidation ditch process for wastewater treatment. The hydraulic retention time of the oxidation ditch is 5 hours. The SRT was estimated as 6 days. After the first 2-hour anaerobic section (only slow stirring), a surface jet aerator is used to provide oxygen into the mixed liquor. This aerator is the only DO source (other than surface aeration) between influent and effluent. Five sampling points were selected to cover the entire water path: at the influent, at the end of the anaerobic section (right before the aerator), and then at one hour intervals. The last sampling point was placed at the effluent.

Figure 7 shows DO, COD, pH and temperature profiles in the oxidation ditch. There were only mineral changes on temperature and pH values. COD was reduced from 124 mg/L to 61 mg/L, a 50.8% removal. DO increased from 0.17 mg/L to 1.78 mg/L after the aerator, but dropped to 0.17 mg/L at the effluent.

Figure 8 illustrates the phosphate profile in the oxidation ditch under the same conditions as in Figure 7. Although the P removal was as high as 97.8% (from 27.06 ppm to 0.62 ppm), the phosphorus concentration increased from 0.2 ppm to 0.62 ppm in the last anoxic section via secondary release in the presence of low DO between hours 4 and 5. When the DO concentration is low enough (0.17 mg/Lat hour 5), the PAOs start to release phosphate back into the bulk water. Additonal aeration toward the end of the oxidation ditch would help to eliminate the secondary release.

The high P removal shown in Figure 8 suggests that there is an adequate population of PAOs in the activated sludge at the Upper Mill Creek Plant. Also, this plant has a relatively high pH, around 7.5 with a maximum 7.98. Because a higher pH value would favor the PAOs growth and activities (Filipe et al. 2001; Jeon et al. 2001a; Serafim et al. 2002), a better P removal rate could be expected at this plant compared to the MSD Mill Creek Plant..

PSBR Study at the Upper Mill Creek Plant

Because the low DO at the end of the oxidation ditch appeared to cause secondary release of P, The PSBR was set up to provide more aeration between hours four and five. Figure 9 shows the DO and phosphorus profiles for the PSBR. Although the DO was relatively low between hours 2 and 4, phosphorus was effectively removed and the effluent P was near zero.

CONCLUSIONS

- The aeration tank at the Mill Creek Plant was operated with an initial 1 hour anaerobic zone followed by a two hour aerobic zone and alternating half-hour anaerobic and aerobic zones. Under these conditions significant phosphate removal (86%) was attained. However, the effluent phosphate was still higher than the target 1 ppm. The data suggested that P removal could be improved by using a longer anaerobic zone coupled with longer subsequent aerobic and anaerobic zones. This hypothesis was tested using the PSBR with a 2 hour initial anaerobic period and subsequent 1 hour alternating aerobic and anaerobic periods. The results showed increased phosphate concentration at the end of the anaerobic period with effluent P concentrations near zero, or lower than the IC detection limit.
- The Upper Mill Creek Plant showed substantial biological phosphorus removal (97.8%) prior to this study. However, this high removal was not consistently attained. This inconsistency was attributed to a low DO zone at the effluent that promoted secondary phosphate release. PSBR studies indicated that providing more DO at the effluent end consistently reduced the effluent P to near zero.
- For instances where the plant already has developed an adequate population of phosphorus accumulating organisms (PAO's), the Pilot Scale Batch Reactor (PSBR) is a useful tool for investigating the influence of changes in anaerobic/aerobic zones in the aeration tank on biological phosphorus removal.

LITERATURE CITED

Aman, A. and P. L. Bishop (1999). "Improved aeration efficiency using intermittent aeration at the Mill Creek Wastewater Treatment Plant." *72nd Annual Water Environmental Federation Conference*.

Artan, N., R. Tasli, et al. (1998). "The fate of phosphate under anoxic conditions in biological nutrient removal activated sludge systems." *Biotechnology Letters* 20(11): 1085-1090.

Baetens, D., P. A. Vanrolleghem, et al. (1999). "Temperature effects in bio-P removal." *Water Science and Technology* 39(1): 215-225.

Carrera, J., M. Sarra, et al. (2001). "Effect of Different Operational Parameters in the Enhanced Biological Phosphorus Removal Process. Experimental Design and Resultsl." *Environmental Technology* 22: 1439-1446.

Carucci, A., Lindrea, K., Majone, M., and Ramadori, R. (1999). "Different mechanisms for the anaerobic storage of organic substrates and their effect on enhanced biological phosphate removal (EBPR)." *Water Science and Technology*, 39(6), 21-28.

Chen, Y., A. A. Randall, et al. (2004). "The efficiency of enhanced biological phosphorus removal from real wastewater affected by different ratios of acetic to propionic acid." *Water Research* 38(1): 27-36.

Dassanayake, C. Y. and R. L. Irvine (2001). "An enhanced biological phosphorus removal (EBPR) control strategy for sequencing batch reactors (SBRs)." *Water Science & Technology* 43(3): 183-189.

Filipe, C. D. M., G. T. Daigger, et al. (2001). "Effects of pH on the Rates of Aerobic Metabolism of Phosphate-Accumulating and Glycogen-Accumulating Organisms." *Water Environment Research* 73(2): 213-222.

Hood, C. R. and A. A. Randall (2001). "A biochemical hypothesis explaining the response of enhanced biological phosphorus removal biomass to organic substrates." *Water Research* 35(11): 2758-2766.

Jeon, C. O., D. S. Lee, et al. (2001a). "Enhanced Biological Phosphorus Removal in an Anaerobic–Aerobic Sequencing Batch Reactor: Effect of pH." *Water Environment Research* 73(3): 301-306.

Jeon, C. O., D. S. Lee, et al. (2001b). "Enhanced Biological Phosphorus Removal in an Anaerobic–Aerobic Sequencing Batch Reactor: Characteristics of Carbon Metabolism." *Water Environment Research* 73(3): 295-300.

Keller, J., Yuan, Z., and Blackall*, L. L. (2002). "Integrating process engineering and microbiology tools to advance activated sludge wastewater treatment research and development." *Reviews in Environmental Science and Biotechnology*, 1(1), 83-97.

Mino, T., van Loosdrecht, M. C. M., and Heijnen, J. J. (1998). "Microbiology and biochemistry of the enhanced biological phosphate removal process." *Water Research*, 32(11), 3193-3207.

Nielsen, A. T., W.-T. Liu, et al. (1999). "Identification of a Novel Group of Bacteria in Sludge from a Deteriorated Biological Phosphorus Removal Reactor." *Applied and Environmental Microbiology* 65(3): 1251-1258.

Oa, S. W. and E. Choi (1997). "Phosphorus removal from nightsoil with sequencing batch reactor (SBR)." *Water Science and Technology* 36(12): 55-60.

Pijuan, M., Saunders, A. M., Guisasola, A., Baeza, J. A., Casas, C., and Blackall, L. L. (2004). "Enhanced biological phosphorus removal in a sequencing batch reactor using propionate as the sole carbon source." *Biotechnology and Bioengineering*, 85(1), 56 - 67.

Randall, A. A., L. D. Benefield, et al. (1997). "Induction of phosphorus removal in an enhanced biological phosphorus removal bacterial population." *Water Research* 31(11): 2869-2877.

Serafim, L. S., P. C. Lemos, et al. (2002). "Effect of pH control on EBPR stability and efficiency." *Water Science & Technology* 46(4-5): 179-184.

Seviour, R. J., Mino, T., and Onuki, M. "The microbiology of biological phosphorus removal in activated sludge systems." *FEMS Microbiology Reviews*.

Zeng, R. J., R. Lemaire, et al. (2003). "Simultaneous nitrification, denitrification, and phosphorus removal in a lab-scale sequencing batch reactor." *Biotechnology and Bioengineering* 84(2): 170 - 178. EE

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