Nutrient Recovery and Management 2011
Inside and Outside the Fence

January 9-12, 2011
Hilton Miami Downtown
Miami, Florida, USA

*Conference Workshops, Tours, Ticketed Breakfasts, and Opening General Session materials are all available online at www.Nutrient2011.org.
Session 1: Advances in Enhanced Biological Phosphorus Removal
Monday, January 10, 2011
1:30pm-5:15pm

Moderator
Sam Jeyanayagam, CH2M Hill
Mark Van Loosdrecht, TU Delft

1A 1:30pm Fermentation of Mixed Liquor for Phosphorus Removal
James L. Barnard, Black & Veatch

1B 1:50pm The inhibitory effects of Free Nitrous Acid on anaerobic metabolism of PAOs and GAOs
Liu Ye, The University of Queensland

1C 2:10pm Microbial Population in an A2O System Operated Under Different Carbon Sources
Luiza Girard Machado, Federal University of Pará (Brazil)

TB1 2:30pm Rapid Increase in Acetate uptake Rate of Glycogen-Accumulating Organisms
Masafumi Fujita, Ibaraki University

2:35pm Discussion

3:00pm Networking Break

1D 3:45pm Simultaneous Biological Nutrient Removal in a Single-Stage, Low Oxygen Aerobic Reactor
Jose A Jimenez, Brown and Caldwell

1E 4:05pm Low temperature biological phosphorus removal and partial nitrification in a pilot SBR system
Qiuyan Yuan, University of Manitoba

1F 4:25pm Enhanced Biological Phosphorus Removal of Low Strength Municipal Sewage at 30 Celsius Using Laboratory-Scale Modified Bardenpho Process
Cao Yeshi, Public Utilities Board, Singapore

TB2 4:45pm Designing for EBPR in the Presence of SND: Experience at a Large Scale Treatment Facility
Leon Downing, Freese and Nichols

4:50pm Discussion

Poster 1 Linking EBPR with the BABE Technology
Aurora Seco, University of Valencia

Poster 2 Free Nitrous Acid (FNA) Inhibition on Aerobic and Anoxic Phosphate Uptake and Denitrification by Denitrifying Poly-phosphate Accumulating Organisms: A Comparative Study
Lily Ganda, NTU

**Poster 3**

**Performance of and PAO/GAO Competition in Enhanced Biological Phosphorus Removal Activated Sludge Process of Municipal Sewage Treatment at Warm Climates**

Cao Yeshi, *Public Utilities Board, Singapore*
Session 2:  Fate of Organic Nitrogen and Nonreactive Phosphorus
Monday, January 10, 2011
1:30pm-3:00pm

Moderator  Jacek Makinia, U. Gdansk
Joe Husband, Malcolm Pirnie

2A  1:30pm  Bioavailability of Dissolved Organic Nitrogen in Wastewater Effluent as Determined by Resin Separation
David L Sedlak, UC Berkeley

2B  1:50pm  Experimental and model-based evaluation of the DON and CON fate in biological nutrient removal activated sludge systems
Jacek Makinia, University of Washington, Seattle

2C  2:10pm  Molecular Variability in Wastewater Organic Matter and Implications for Phosphorus Removal Across a Range of Treatment Technologies
Scott Smith, Wilfrid Laurier University

TB1  2:30pm  Florida’s Numeric Nutrient Criteria and the Potential Importance of Dissolved Organic Nitrogen
Rosalyn Matthews, Hazen and Sawyer

TB2  2:35pm  Analysis of Organic Nitrogen Removal in Municipal Wastewater by Reverse Osmosis
Rion Merlo, Brown and Caldwell

2:40pm  Discussion
Session 3:  Algae Technology in Nutrient Management
Monday, January 10, 2011
1:30pm-3:00pm

Moderator
Art Umble, Greeley & Hansen, LLC
Frank Rogalla, Aqualia

3A  1:30pm  Algae Alchemy: Nutrients to Biofuel - Extracting Value From Wastewater
John Benemann

3B  1:50pm  Microalgae growth for nutrient recovery from sludge liquor and production of renewable bioenergy
Bjorn Rusten, Aquateam-Norwegian water technology centre

3C  2:10pm  Reducing the Nutrient Impacts of Aquaculture Through the Use of an Algal Photobioreactor Production System
Sarina J Ergas, University of South Florida

TB1  2:30pm  A STELLA Model for Integrated Algal Biofuel Production and Wastewater Treatment
Ivy Cormier, University of South Florida

TB2  2:35pm  Removal of Nitrogen (NH3/NH4+) from Wastewater by Chlorella vulgaris
Joo-Youp Lee, University of Cincinnati

2:40pm  Discussion
Session 4: Operation to Achieve Low Nitrogen and Phosphorus Concentrations: Unique Challenges
Monday, January 10, 2011
3:45pm-5:15pm

Moderator Charles Bott, Hampton Roads Sanitation District
Qiuyan Yuan, University of Manitoba
2.0 Moderator: Lucas Botero, CDM

4A 3:45pm WEF/WERF Cooperative Study of Nutrient Removal Plants: Achievable Technology Performance Statistics for Low Effluent Limits
Denny S. Parker, Brown and Caldwell

4B 4:05pm Optimizing Moving Bed Biofilm Reactor (MBBR) and Biologically Active Filter (BAF) Design and Operation for Nitrogen and Phosphorus Removal
Joshua P. Boltz, CH2M HILL

4C 4:25pm N&P Removal from RO Brine – A “New” LOT Operations Challenge
Mark Thomas Steichen,

TB1 4:45pm Pilot-Scale MBR and RO Process for COD, Nitrogen and Phosphorus Remotions of Mixed Domestic - Industrial Wastewater at 30 Celsius in Singapore
Cao Yeshi, Public Utilities Board, Singapore

TB2 4:50pm Can we operate Deep Bed Denitrification Filters with limited phosphorus?
Dilli R Neupane, AECOM

4:55pm Discussion

Poster 1 Uneven Distribution of Nitrifying Bacteria in Secondary Clarifiers of Biological Nutrient Removal Systems
Peter Stroot, University of South Florida

Poster 2 Annual Nutrient Limits and Effluent Trading Programs Change the Planning, Design and Operation Paradigm
Joseph Husband, Malcolm Pirnie, Inc

** A live webcast of this session will be available at no charge to WEF and IWA members! Additional registration details will be posted in November at www.Nutrient2011.org.
Session 5:  Watershed Modeling
Monday, January 10, 2011
3:45pm-5:15pm

Moderator        Alan Vicory, ORSANCO
                 Chad Drummond, Geosyntec Consultants

5A   3:45pm     TBD

5B   4:05pm     The use of a sewers-WWTPs-river integrated model allows the
efficient minimization of ammonia peaks and oxygen dips in a river
Lorenzo Benedetti, Ghent University

5C   4:25pm     Selecting Appropriate Centralized and Decentralized Treatment
Options for the Management of Nutrients in the Chesapeake Bay – A
Case Study for Anne Arundel County, MD
Brian Marengo, CH2M HILL, Inc.

4:45pm   Discussion
Session 6: Phosphorus Recovery  
Tuesday, January 11, 2011  
8:30am-10:00am  

Moderator  
Jan Oleszkiewicz, University of Manitoba  
Ahren Britton, Ostara  

6A  8:30am  Phosphorus recovery from wastewater – State of the art and future potential  
Christian Sartorius, Fraunhofer ISI  

6B  8:50am  Phosphorus and Aluminium Recovery from Sewage Sludge Ash by a novel two Step wet chemical Elution Process (SESAL-Phos – Recovery Process)  
Sebastian Petzet, Technische Universität Darmstadt  

6C  9:10am  Phosphate Fertilizers from Sewage Sludge Ash - Design of an Industrial Manufacturing Plant  
Ludwig Hermann, ASH DEC Umwelt AG  

9:30am  Discussion  

Poster 1  Perspectives on Nitrogen and Phosphorus Recovery from Wastewater: The State of the Industry  
Christine deBarbadillo, Black & Veatch  

Poster 2  Handbook on Phosphorus Recycling in Wastewater Treatment Plants in Japan: Optimizing Design of Phosphorus Resource Recovery From Biosolids and Wastewater  
Masayoshi Minami, Japan Institute of Wastewater Engineering Technology
Session 7: External Carbon Sources - Optimization and Modeling  
Tuesday, January 11, 2011  
8:30am-12:15pm

Moderator: Ulf Nyberg, Malmo  
Salil Kharkar, DCWASA

**7A  8:30am** Recycling Nitrates to Headworks for Multiple Benefits in a Fixed Film Plant  
John Bratby, Brown and Caldwell

**7B  8:50am** Operations of four (4) newly build denitrification plants in the Florida Keys: Little Venice, Coco Plum, Area 4 and Key Largo WWTP’s.  
Erica Lynn Latker, Environmental Operating Solutions

**7C  9:10am** Usage of Glycerol for Denitrification in High Rate Activated Sludge Processes: Benefits and Limitations  
D. Katehis, CH2M Hill

**TB1  9:30am** Faster SDNRs with Prolonged Glycerin Addition, Carbon Storing Bugs, the Enemy (Dissolved Oxygen), and Other Things Encountered While Piloting Supplemental Carbon at Several BNR Plants  
Katya Bilyk, Hazen and Sawyer

**9:35am** Discussion

**10:00am** Networking Break

**7D  10:45am** Successful Application of an Alternative Carbon Source to Denitrification Filters: Full Scale Implementation at the 50 MGD Littleton - Englewood Advanced Wastewater Treatment Plant  
Samuel Augustine Ledwell, Environmental Operating Solutions, Inc.

Observations on the Performance and Modeling of Glycerin-fed Denitrification Filters  
Katya Bilyk, Hazen and Sawyer

**7E  11:05am** Modeling external carbon addition in combined N-P activated sludge systems with an extension of the IWA Activated Sludge Models  
Jacek Makinia, Gdansk University of Technology

**7F  11:25am** Modelling the use of External Carbon Substrate for Denitrification by Generalists and Specialists  
Ahmed Omari, AECOM

**TB2  11:45am** A distillery by-product as an external carbon source for enhancing denitrification in mainstream and sidestream treatment processes  
Jacek Makinia, University of Washington, Seattle

**11:55am** Discussion
Poster 1  Differences Between Biofilm and Suspended Denitrifying Bacteria Assimilating Glycerol in a Moving Bed Biofilm Reactor
Kartik Chandran, Columbia University

Poster 2  Particle Size Separation Implications on COD Removal before BNR: A Case Study
Remy Newcombe, Blue Water Technologies, Inc.
Session 8: Sustainability Considerations
Tuesday, January 11, 2011
8:30am-12:15pm

Moderator

Sarina Ergas, University of South Florida
David Stensel, University of Washington
Twitter Team: Dave Kinnear, HDR; Thor Young, GHD; Leslie Knapp, University of South Florida

8A 8:30am Comparative Analysis of Parallel IFAS and ASP Reactors: Oxygen Transfer and Uptake, Nutrient Removal, Carbon and Energy Footprint
Diego Rosso, University of California, Irvine

8B 8:50am Impacts of Post Aerobic Digestion on the Design of Nutrient Removal Facilities
Bruce R Johnson, CH2M HILL

8C 9:10am Oh Where, Oh Where Has My Carbon Gone? How Do I Get It Back?
Kenneth Brischke, MWH Global

TB1 9:30am Model-Based Optimization of Controller Settings at the WWTP of Oostende: Trade-Off Between N Removal and Energy Savings
Lorenzo Benedetti, Ghent University

9:35am Discussion

10:00am Networking Break

8D 10:45am Finding the Balance Between Wastewater Treatment Nutrient Removal and Sustainability, Considering Capital and Operating Costs, Energy, Air and Water Quality, and More
Michael Wayne Falk, HDR Engineering

8E 11:05am Life Cycle Assessment of the Relative Benefits of Meeting Ultra-Low Nutrient Limits at WWTPs
Andrew R. Shaw, Black & Veatch

8F 11:25am Technologies Available to Meet Numeric Nutrient Criteria and their Associated Economic and Environmental Impacts
Joyeeta Banerjee, Hazen and Sawyer

TB2 11:45am The Business Case Evaluation Applied to Mainstream and Sidestream Treatment Process Selection at a Municipal WWTP Upgrading to BNR
Adam Klein, Brown and Caldwell

11:50am Discussion

** Participate in the discussions at this session on Twitter by using the hashtag #NR2011. More information will be available in November at www.Nutrient2011.org. **
Session 9: Phosphorus Recovery Through Struvite Precipitation
Tuesday, January 11, 2011
10:45am-12:15pm

Moderator
Joshua Boltz, CH2M Hill
Aurora Seco, University of Valencia

9A 10:45am Prevention of Struvite Scaling in Digesters combined with Phosphorus Removal and Recovery - The FIX-Phos Process
Sebastian Petzet, Technische Universität Darmstadt

9B 11:05am Phosphorus Recovery From Anaerobic Digester Supernatant by Struvite [MAP (Mg.NH4.PO4.6H2O)] Crystallization: Modeling of a Fluidized Bed Reactor Incorporating Thermodynamics, Kinetics and Reactor Hydrodynamics
Md. Saifur Rahaman, Yale University

9C 11:25am Effect of Micropollutants in Wastewater on Recovered Struvite
Demet Antakyali, Universität Stuttgart

TB1 11:45am Development of a Process Controller for the Operation of a Struvite Crystallization Process
Kazi Parvez Fattah, Associated Engineering Ltd.

TB2 11:50am Sustainable Phosphorus Recovery From Anaerobically Digested Dairy Manure
Wendong Tao, SUNY College of Environmental Science and Forestry

11:55am Discussion

Poster 1 Recovery of Nutrients from Anaerobic Co-digestion Effluents of Poultry Manure and Sewage Sludge as Struvite
Goksel Demirer, METU

Poster 2 Effects of Crystallization Reagents on Phosphorus Precipitation From Anaerobically Digested Pig Effluent
Aurélie Faucher, Cemagref

Poster 3 Anaerobic Fermentation of Swine Manure to Increase P Removal by Struvite Precipitation
Joe Ackerman, University of Manitoba
Session 10: Nutrient Recovery from Effluents
Tuesday, January 11, 2011
1:30pm-3:00pm

Moderator
James Barnard, Black and Veatch
Yeshi Cao, PUB Singapore

10A 1:30pm A comparative study of the recovery of ammonium from clinoptilolite exhausted with conventional domestic wastewater and with source separated human urine
Bilsen Beler Baykal, Istanbul Technical University

10B 1:50pm Removal and Recovery of Phosphorus and Potassium from Human Urine by Precipitation of Magnesium Potassium Phosphate
Kangning Xu, Tsinghua University

10C 2:10pm Phosphorus Recovery with New Ultra-Low Adsorption Process
James D Fitzpatrick, Black & Veatch Corporation

TB1 2:30pm Biological Induced Phosphorus Precipitation in Aerobic Granular Sludge for Wastewater Treatment
Angela MANAS, LISBP/LGC/INSA toulouse

TB2 2:35pm Use of Gas-permeable Membranes for the Removal and Recovery of Ammonia from High Strength Livestock Wastewater
Matias Vanotti, USDA-ARS

2:40pm Discussion

Poster 1 Innovative Chemically Enhanced Nutrient Removal and Recovery Technology
Edward Weinberg, O'Brien & Gere, Inc.

Poster 2 Use of Gas-permeable Membranes for the Removal and Recovery of Ammonia from High Strength Livestock Wastewater
Matias Vanotti, USDA-ARS
Session 11: Optimization of Nitrogen and Phosphorus Removal Processes
Tuesday, January 11, 2011
1:30pm-5:15pm

Moderator
Stefan Weijers, Waterschap de Dommel, NL
Thomas Wilson, TEW Environmental Engineers, LLC

11A 1:30pm  Not Your Daddy’s Wastewater Treatment Plant – The Johns Creek Environmental Campus
Peter Frank Schuler, Brown and Caldwell

11B 1:50pm  Process Modeling And Full Scale Rerate Pilot Testing Results In Innovative BNR Step Feed Process
Ron James Latimer, Hazen and Sawyer

11C 2:10pm  Design and Commissioning of Calgary’s New State-of-the-Art Biological Nutrient Removal WWTP
Barry Rabinowitz, CH2M HILL Canada Limited

TB1 2:30pm  Influence of Aeration on Nitrogen Removal in a Biological Packed Bed Reactor for Residuals Removal
Antonio Albuquerque, University of Beira Interior

2:35pm  Discussion

3:00pm  Networking Break

11D 3:34pm  Ballasted Biological Process Achieves Low Nitrogen and Phosphorus without Tertiary Filtration
Steven E Woodard, Cambridge Water Technology

11E 4:05pm  Bioaugmentation with ammonia oxidizing bacteria (AOB) selected in an alternating bioreactor
Giulio Munz, University of Florence

11F 4:25pm  Combining flocs and granular sludge: An alternative strategy for nitrogen removal?
Ahlem Filali, GPE-INSA Toulouse

TB2 4:45pm  Presence and Significance of Anammox Spcs and Ammonia Oxidizing Archea , Aoa, in Full Scale Membrane Bioreactors for Total Nitrogen Removal
Eugenio Giraldo, American Water

4:50pm  Discussion

Poster 1  City of Tallahassee T.P. Smith WRF Upgrade from Secondary Limits to ENR Nitrogen Limits
Kurt Pfeffer, Hazen and Sawyer, P.C.
Poster 2  Henrico County WRF - Lessons From Ten years of Progressively Improved BNR Performance  
Theresa Bruton, Henrico County

Session 12:  Greenhouse Gas Emissions: Balancing Water Quality and Sustainability  
Tuesday, January 11, 2011  
1:30pm-5:15pm

Moderator  Julian Sandino, CH2M Hill  
Lynette Cardoch, MWH

12A  1:30pm  Greenhouse Gas Emissions from Wastewater Treatment Operations  
Mark von Loosdrecht, University Delft

12B  1:50pm  A Comparison Of Partial And Full Nitrification Processes: Microbial Ecology, Biokinetics And Nitrous Oxide Production  
Kartik Chandran,

12C  2:10pm  Contrastive N2O emissions from partial nitritation and anammox at an industrial WWTP  
Siegfried Elias Vlaeminck, Ghent University

2:30pm  Discussion

3:00pm  Networking Break

12D  3:45pm  Modelling nitrous and nitric oxide emissions by autotrophic ammonium oxidizing bacteria  
Kris E. Mampaey, Ghent University

12E  4:05pm  N2o Emissions: Impact Of Process Configuration And Diurnal Loading Patterns  
Dwight Houweling, EnviroSim Associates Ltd.

12F  4:25pm  Nitrous Oxide Emissions from Deammonification Processes Determined in Lab-scale Experiments  
Yvonne Schneider, Leibniz University of Hanover

TB1  4:45pm  The IWA Greenhouse Gas Task Group Perspective on the Use of Water Quality and Process Models for Sustainable Wastewater Management  
Jose Porro, Malcolm Pirnie

4:50pm  Discussion
Session 13: Nutrient Recovery Cost and Full-Scale Perspectives
Tuesday, January 11, 2011
3:45pm-5:15pm

Moderator
Elzbieta Plaza, Royal Institute of Technology
Mario Benisch, HDR

13A 3:45pm  Increasing Revenue While Reducing Nuisance Struvite Precipitation: Pilot Scale Testing of the WASSTRIP Process
Peter J Schauer, Black & Veatch

13B 4:05pm  Full scale phosphate recovery: process control affecting pellet growth and struvite purity
Wim HM Moerman, NuReSys

13C 4:25pm  Results of the first year’s operation of North America’s First Full Scale Nutrient Recovery Facility
Rob Baur, Clean Water Services

TB1 4:45pm  Economic Evaluation of Phosphorus Recovery Processes
Kaoru Kato, Japan Institute of Wastewater Engineering Technology

TB2 4:50pm  Phosphorus Recovery Potential in Anaerobic Digestion Residues
Goksel N Demirer, METU

4:55pm  Discussion

Poster 1  Sidestream Ammonia Recovery: Ammonium Sulfate Fertilizer Production and Marketing – A Sustainable Alternate to Biological Approaches
Ralph Eschborn, AECOM

Poster 2  A Little Dab Will Do: Acid Sludge Addition to Promote WAS Phosphorus Release Prior to Anaerobic Digestion
Alan Grooms, Madison Metropolitan Sewerage District
Session 14: Focused Discussion: Phosphorus Removal to Very Low Levels
Wednesday, January 12, 2011
8:30am-12:00pm

Moderator
JB Neethling, HDR
Bilsen Baykal, U. Istanbul

14A 8:30am  Chemically Mediated Phosphorus Removal: Testing of Aluminum and Iron Surface Complication Mechanisms
Scott Smith, Wilfrid Laurier University

14B 8:50am  Phosphorus Fractionation in Various Tertiary Effluents- Insights into and Implications for Advanced Phosphorus Removal
April Gu, Northeastern University

14C 9:10am  Pilot Testing Of A High Efficiency Adsorbent System For Phosphorus Removal And Recovery From Municipal Wastewater Secondary Effluent
Koji Tsuji, Japan Sewage Works Agency

14D 9:30am  Development of Full-scale Sizing Criteria from Tertiary Pilot Testing Results to Achieve Ultra-low Phosphorus Limits at Innisfil, Ontario
Christine Debarbadillo, Black & Veatch

9:50am  Networking Break

14E 10:15am  West Camden STP Advanced System Design Achieves Total Phosphorus less than 0.04 mg/L
Bruce R Johnson, CH2M HILL

14F 10:35am  Reliability of Low P Technologies in the Real World – First Results from a Two-Year Demonstration Program
Mario Benisch, HDR

TB1 10:55am  TBD

11:00am  Discussion
Session 15: Focused Discussion: Advances in Deammonification Processes
Wednesday, January 12, 2011
8:30am-12:00pm

Moderator

Bernhard Wett, University of Innsbruck
Beverley Stinson, AECOM

15A 8:30am Approaching energy-positive sewage treatment: OLAND removes nitrogen from low-strength wastewater
Siegfried Elias Vlaeminck, Ghent University

15B 8:50am Implementation Of A Full-Scale Anammox-Based Facility To Treat Anaerobic Digestion Sidestreams At The Alexandria Sanitary Authority Advanced Wastewater Treatment Facility
Glen T Daigger, CH2M HILL

15C 9:10am Deammonification of Dewatering Sidestream from Thermal Hydrolysis – Mesophilic Anaerobic Digestion Process
Bryce A Figdore, AECOM

15D 9:30am Influence of aeration conditions on nitrogen removal rate in one stage partial nitritation/anammox process
Jingjing Yang, Royal Institute of Technology (KTH)

9:50am Networking Break

15E 10:15am 1-stage Deammonification MBBR process for reject water sidestream treatment: investigation of start-up strategy and carriers design
Romain Lemaire, Anjou Recherche

15F 10:35am Swedish experience with deammonification process in biofilm system
Jozef Trela, Royal Institute of Technology (KTH)

TB1 10:55am Full scale robust ANAMMOX performance and design
Wiebe Ruurd Abma, Paques BV

TB2 11:00am High-rate nitrogen removal by the Anammox process with a sufficient inorganic carbon source
Yang Jiachun, Graduate School of Science and Technology

11:05am Discussion

Poster 1 High Rate Nitrogen Removal Performance by CANON Process
Yang Jiachun, Kumamoto University

Poster 2 High-Rate Nitrogen Removal from Anaerobic Digester Liquor with Anammox Process
Zhang Li, Kumamoto University
**Poster 3**  
**Anammox Process Inhibition by Oxytetracycline**  
Pongsak Noophan, *Kasetsart University*

**Poster 4**  
**Nitrogen Removal from Ammonium-Rich Digester Liquor by Combining Anammox and Partial Nitrification Process in a Single-Stage Reactor**  
Sen Qiao
Session 16: Focused Discussion: Natural Systems for Nutrient Removal
Wednesday, January 12, 2011
8:30am-12:00pm

Moderator  Julianne LaRock, South Florida Water Management District
Richard Isleib, HydroQual, Inc.

16A 8:30am  The Possible Contribution of Suspension Feeding Bivalves to Nutrient Remediation in Eutrophied Coastal Waters
Roger Newell, Horn Point Laboratory

16B 8:50am  Treatment Wetlands for TMDL and Numeric Nutrient Criteria Compliance: Technology Advantages and Constraints
James S Bays, CH2MILL

16C 9:10am  Implementation of the Phosphorus TMDL for Lake Champlain
Julie Moore, Vermont Agency of Natural Resources

16D 9:30am  Algal Turf Scrubber
TBD

9:50am  Networking Break

16E 10:15am  Cattail Farming for Water Quality: Harvesting Cattails for Nutrient Removal and Phosphorus Recovery in the Watershed
Richard Grosshans, International Institute for Sustainable Development

16F 10:35am  Hybrid Wetlands
TBD

TB1 10:55am  Periphyton Stormwater Treatment Areas
TBD

11:00am  Discussion