

Fiscal Year 2013 - Studies, research papers, and analyses

DC Water continues to focus on the long term planning for the future of Blue Plains AWTP. The goal in general is to determine the vision of which the plant will be able to face future issues like continue improving water, air and solids quality, process intensification, energy neutrality and sustainability. DC Water seeks innovation in technologies that are most suitable to address these issues. Technology projects are focused on reengineering existing infrastructure to achieve energy and carbon neutrality while continuing to meet ever-more stringent water quality permits. A list of current projects with publications are listed below.

Topic: Nitrogen short cut via anammox reaction in a deammonification pilot plant, a process that can dramatically reduce energy and carbon needs, and thus save money.

Publications (2013):

- Stinson B.M., Murthy S., Bott C., Wett B., Al-Omari A., Bowden G., Mokhyerie Y. and De Clippeleir H. Roadmaps Toward Energy Neutrality Chemical Optimization at Enhanced Nutrient Removal Facilities. WEF/IWA Nutrient removal and recovery trends in resource recovery and use, Vancouver, 28-31th July 2013
- Al-Omari A., Wett B., Han M., De Clippeleir H., Bott C., Nopens I. and Murthy S. Competition Over Nitrite in Single Sludge Mainstream Deammonification Process. WEF/IWA Nutrient removal and recovery trends in resource recovery and use, Vancouver, 28-31th July 2013.
- De Clippeleir H., Jimenez R., Giraldo E., Wett B., Dockett N., Riffat R., Al-Omari A. and Murthy S. Screens as a Method for Selective Anammox Retention in Single Stage Deammonification Processes. WEF/IWA Nutrient removal and recovery trends in resource recovery and use, Vancouver, 28-31th July 2013
- Regmi, P., Holgate, B., Miller, M. W., Bunce, R., Park, H., Chandran, C., Wett, B., Murthy, S., Bott, C. (2013) NOB out-selection in mainstream makes two-stage deammonification and nitrite-shunt possible. Proc. IWA/WEF Conf. On Nutrient Removal and Recovery, Vancouver.
- Wett B., Omari A., Podmirseg S. M., Han M., Murthy S., Bott C., Hell M., Takács I., Nyhuis G., Gómez Brandón M. & O'Shaughnessy M. (2013) Going for mainstream deammonification from bench- to full-scale for maximized resource efficiency. Water Science & Technology

Topic: Investigating the source for odorous compounds in treatment processes at Blue Plains AWTP.

Publications (2013)

- Lawrence H, Murthy S, Voit K (2013) Off-Gas Analyses Reflect Activated Sludge Operating Conditions. Proceedings 86th Annual Water Env. Fed Technical Exhibition and Conf. , Chicago, IL.
- Voit K, Ehrhardt J, Chan A, Kwiatkowski J, Mulamula L, Bailey W, Carr J, Murthy S (2013) Odor Control Master Planning for Management of Nuisance Odors at Blue Plains Advanced Wastewater Treatment Plant. Proceedings 86th Annual Water Env. Fed Technical Exhibition and Conf. , Chicago, IL.

Topic: Anaerobic digestion process following thermal hydrolysis to develop operating strategies and controls for optimum gas production.

Publication (2013):

- Suzuki R, Murthy S, Mah J, Wett B, J. Novak J, Higgins M, DeBarbadillo C (2013) Maximizing Gas Production at Blue Plains AWTP for High Loaded Digestion Processes. Proceedings 86th Annual Water Env. Fed Technical Exhibition and Conf. , Chicago, IL.

Other projects include the following:

- Investigating sludge thermal hydrolysis in a Cambi™ Pilot. Understand the process optimum operational setpoints and impact on organics biodegradability and dewatering.
- Evaluating design parameters for dewatering thermally hydrolyzed and digested solids. This includes polymer addition strategy for optimal dosing and solids cake production.
- Evaluating fine bubble diffusion fouling mitigation methods to increase aeration efficiency.
- Testing high rate carbon removal technology in an activated sludge pilot to maintain constant metabolic state for maximizing sludge production and minimizing aeration requirement.
- Evaluating corrosion mitigation strategies in the collection system to improve the life of the existing infrastructure.

DC Water also continues its support of research designed to examine the nutrient, carbon, and biological dynamics of soils amended with biosolids. Projects at VA Tech examined several topics, including carbon sequestration and dynamics, fuel crop production, nitrogen dynamics, and drought resistance from microbial secretion of essential plant hormones. This work continues into this fiscal year. Please see the list of 2013 publications on these topics below.

- Li, J.*, G. Evanylo, K. Xia, and J. Mao. 2013. Carbon (1s) K-edge near edge X-ray absorption fine structure (NEXAFS) spectroscopy for carbon dynamics from long-term application of organic amendments. *Soil Science* 178:453-464.
- Liu, X.*, J. Fike, J. Galbraith, W. Fike, D. Parrish, G. Evanylo, and B. Strahm. 2013. Effects of harvest frequency and biosolids application on switchgrass yield, feedstock quality, and theoretical ethanol yield. *Global Change Biology Bioenergy*. doi/10.1111/gcbb.12124/pdf
- Li, J.*, and Evanylo, G.K., 2013. The effects of long-term application of organic amendments on soil organic carbon accumulation. *Soil Science Society of America Journal* 77: 964-973.
- Zhang, X., E.H. Ervin, G.K. Evanylo, J. Li*, and K. Harich. 2013. Corn and soybean hormone and antioxidant metabolism responses to biosolids under two cropping systems. *Crop Sci.*53:2079–2089. doi:10.2135/cropsci2012.11.0668.
- Li, J.* G.K. Evanylo, X. Zhang, and E.H. Ervin. 2013. Effects of biosolids treatment processes on nitrogen cycling and carbon accumulation under various tillage practices. *J. Residuals Science and Technology* 10:29-40.