QUARTERLY PROGRESS REPORT

December 1, 2011 – February 29, 2012

PROJECT TITLE: *Sequential MBR-UV Treatment of Landfill Leachate(Year 2)*

PRINCIPAL INVESTIGATOR(S): Michael Watts*(mwatts@fsu.edu), Daniel Yeh(dhyeh@eng.usf.edu)**

AFFILIATION: *Dept. of Civil & Env. Engineering, Florida State University, **Dept. of Civil & Env. Engineering, University of South Florida

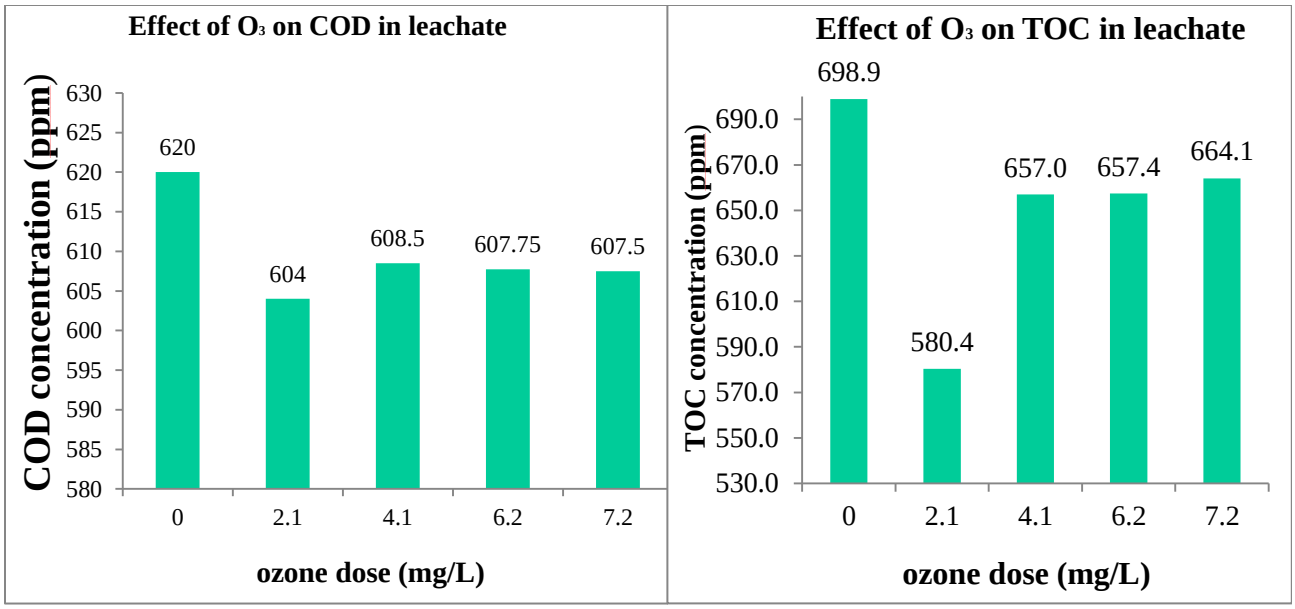
COMPLETION DATE: May 31, 2012 **PHONE NUMBER:** 850.410.6119

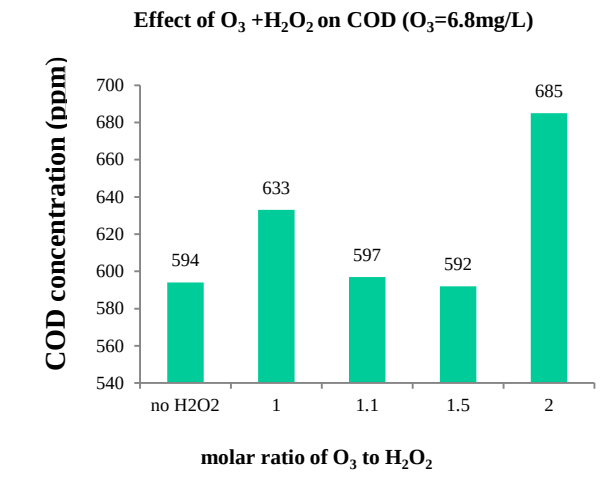
PROJECT WEBSITE ADDRESS (URL):
http://www.eng.fsu.edu/~wattsmi/UV_MBR/index.html

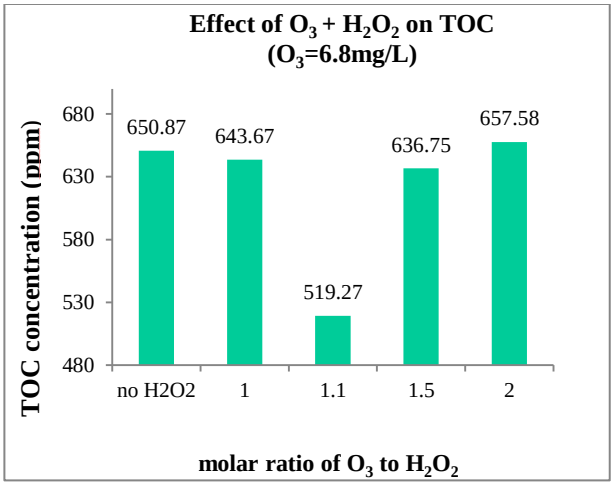
SCOPE OF WORK: The vast quantity of pharmaceuticals, personal-care products, and endocrine-disrupting compounds (EDCs) stored in municipal landfills poses a significant challenge to leachate-water quality. Advanced leachate treatment, utilizing combinations of biological, chemical, and physical water treatments, can be designed to protect groundwaters influenced by landfill-leachate, or provide reclaimed water for non-potable or agricultural purposes. The versatility and multiple barriers in advanced oxidation make it an attractive option for landfill leachate treatment. However, the rich concentration of leachate constituents which scatter or absorb light must be addressed with pre-treatment. A novel membrane bioreactor (MBR) system at USF, involving anaerobic biological process and ultrafiltration membranes, has been tested for removal of trace organic compounds and xenobiotic contaminants (17β-estradiol, a prevalent female hormone) from landfill leachate. This work seeks to apply state-of-the-art, advanced oxidation technology to assist MBR in removal of trace organic compounds.

CURRENT PROJECT PERIOD:

Several quantitative assessments of Leon County Landfill leachate water quality were performed. COD, BOD_5, and TOC measurements were performed according to *Standard Methods for the Examination of Water and Wastewater* (21^{st} ed.). The impact of advanced oxidation, through ozonation, on these leachate water quality parameters was also assessed. The goal of this phase of work is to determine if low-doses of ozone cause significant organics mineralization, and/or reduce chemical oxygen demand.







It is not apparent that the range of ozone doses examined for the oxidation of trace anthropogenic organic contaminants in leachate will significantly reduce either COD or TOC of the studied leachate. However, by varying the stoichiometric ratio of O_3 to H_2O_2 for the 'perxoxone' advanced oxidation process, it is evident that the degree of radical chemistry in leachate is affected. This relationship will be examined further in the coming weeks to determine the optimum peroxide dose for advanced oxidation with ozone.

NEXT PROJECT PERIOD: Evaluation of the advanced oxidation screening experiments will continue in Quarter No. 11. Samples are taken from incubated aspiration bottles (250 mL) after 5, 10, and 15 days. The well-mixed sample is then processed via liquid-liquid extraction with a chlorinated solvent. The solvent phase is then analyzed for E2, TCEP, and TBEP. This sample plan allows for analysis of the 3 contaminants in the combined leachate-sludge phases.

TAG: Dr. Jeff Bandy (*Carollo Engineers*), Dr. Gang Chen (FSU), Dr. Daniel Kuncicky (FDEP), Hooshang Boostani (Hillsborough County), Allan Choate (Polk County), Dr. Ben Stanford (Hazen & Sawyer, P.C.).