

# QUARTERLY PROGRESS REPORT

December 1, 2009 to February 28, 2010

**PROJECT TITLE:** Usage of Microbial Fuel Cell Technology to Prevent Iron Release nearby Landfills in Northwest Florida

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**COMPLETION DATE:** December 1, 2009 to February 28, 2010

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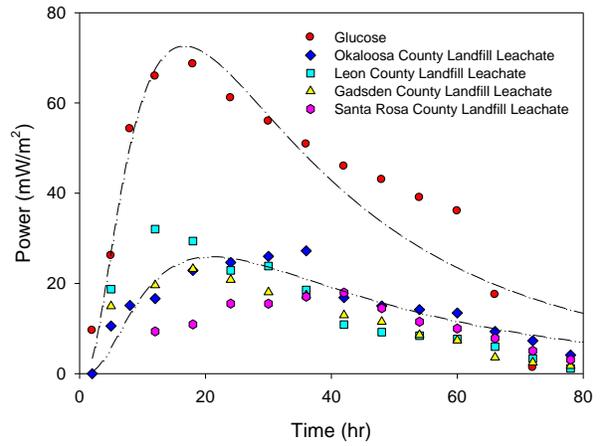
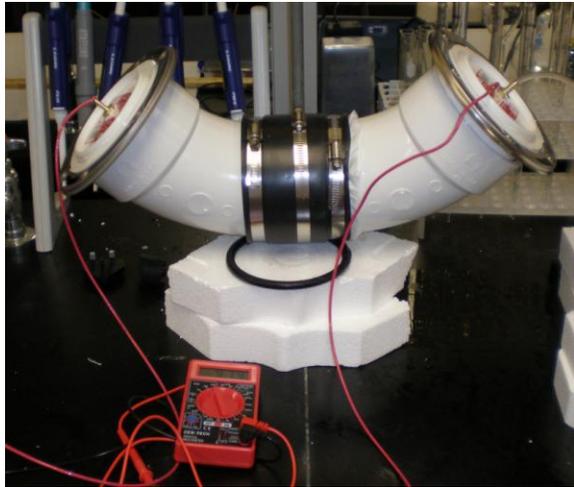
## WORK ACCOMPLISHED DURING THIS REPORTING PERIOD:

### *Laboratory Scale MFC Experiments*

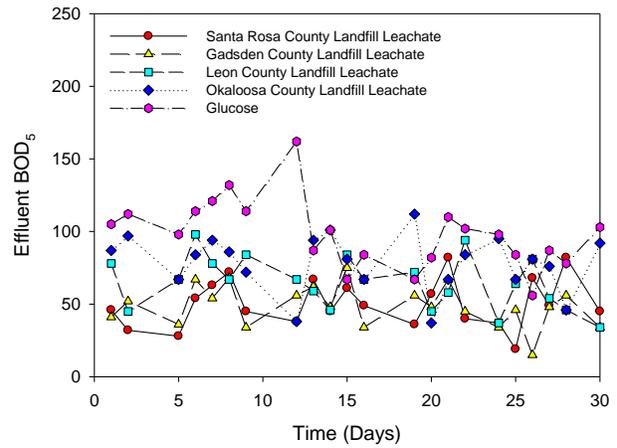
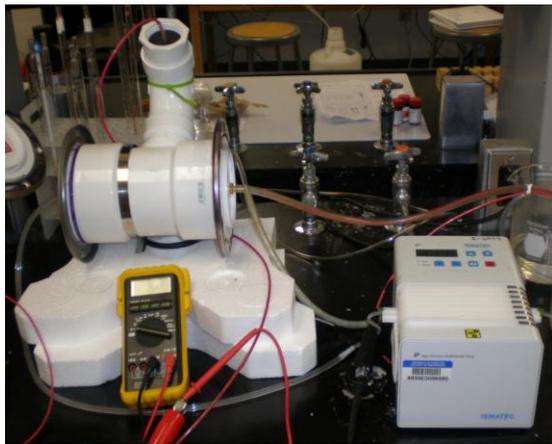
We continued the two dual-chamber MFC experiments, one batch MFC and one continuous MFC, using landfill leachate collected from Gadsden County, Leon County, Okaloosa County and Santa Rosa County. For both of the MFCs, O<sub>2</sub> served as the electron acceptor in the cathode chamber and the anodes and cathodes were connected through a digital multi-meter.

As shown in Figure 1, glucose generated more power (up to 65 mW/m<sup>2</sup>) as compared to those of landfill leachate (up to 30 mW/m<sup>2</sup>). In addition, a self-sharpening power generation front was observed for glucose. However, for landfill leachate, there was an obvious lag, indicating that *Shewanella putrefaciens* needed time to adapt to the landfill leachate. Among the landfill leachate collected from the four counties, landfill leachate collected from Okaloosa County generated the most power, followed by Leon County, Gadsden County and Santa Rosa County.

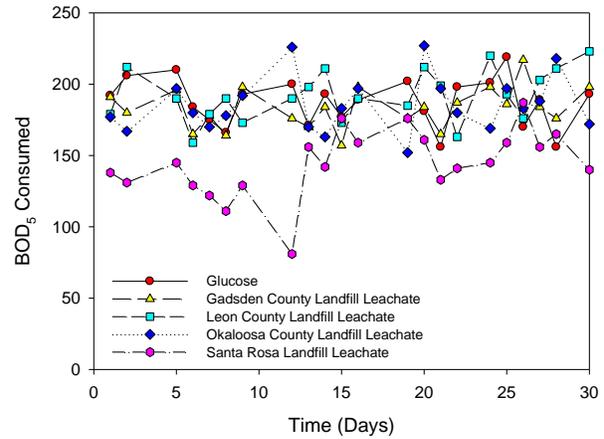
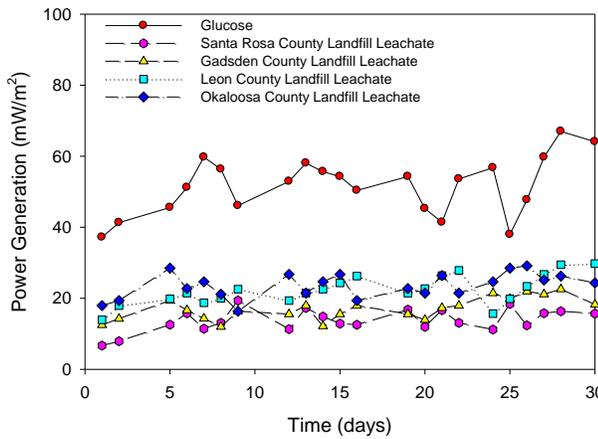
In the continuous MFC, the carbon source was continuously supplied and uninterrupted current was produced (Figure 3). The input landfill leachate was diluted to a BOD<sub>5</sub> value ~ 250 mg/l. After the MFC treatment, the effluent BOD<sub>5</sub> was in the range of 40 ~ 120 mg/l, i.e., around 50 ~ 80% of BOD was remediated (Figure 2). Correspondingly, a stable power of t age of ~ 50 mW/m<sup>2</sup> and ~ 18 mW/m<sup>2</sup> was maintained for glucose and landfill leachate. Among the landfill leachate collected from the four counties, there was a general trend that landfill leachate collected from Okaloosa County generated the most power, followed by Leon County, Gadsden County and Santa Rosa County. The power generation had no relationship with the effluent BOD<sub>5</sub> values. By comparing the power generation with BOD<sub>5</sub> consumption, it was discovered that power generation corresponded to the BOD<sub>5</sub> consumption.



**Figure 1. Batch MFC Setup (Left) and Power Generation (Right)**



**Figure 2. Continuous MFC Setup (Left) and Effluent BOD<sub>5</sub> (Right)**



**Figure 3. Power Generation (Left) and BOD<sub>5</sub> Consumption (Right)**

**FUTURE WORK**

We are currently setting up the pilot MCF facility to test iron release preventions using MFC technologies.

**INFORMATION DISSEMINATION ACTIVITIES:**

TAG members: Lee Martin, Peter Grasel, Casey Taylor, Jim Langenbach, Subramanian Ramakrishnan, Michael Watts, and Clayton Clark

TAG meetings: First TAG meeting was held on August 20, 2009 in RM B202 at FAMU-FSU College of Engineering. The meeting minute is available at [www.eng.fsu.edu/~gchen](http://www.eng.fsu.edu/~gchen).

TAG meetings: Second TAG meeting will be held in June at FAMU-FSU College of Engineering.

**CONFERENCE PRESENTATION:**

Subramaniam, P. K. and Chen, G., Usage of microbial fuel cell technology to prevent iron release nearby landfills in Northwest Florida, 95<sup>th</sup> Annual SAM Southeastern Branch Conference, Savannah, GA, November 6 - 7, 2009.

**JOURNAL PUBLICATION:**

In preparation.