

HINKLEY CENTER FOR SOLID AND HAZARDOUS WASTE MANAGEMENT
Project Abstract

Title: New Technique to Quantify CH₄ Oxidation and Encourage Field Implementation of Biocovers.

Project Duration: September 1st, 2014 – August 31st, 2015

Budget:

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Motivation and Objectives: Many studies using various types of biocover materials to attenuate CH₄ emissions have been performed both at the laboratory and field scale. The results demonstrated that CH₄ emissions can be effectively reduced using compost, amended sandy soils, to name few, as cover materials using several mechanisms. **One of the main issues delaying the field implementation of biocovers capable of reducing CH₄ emissions from landfills, is the lack of a proper field technique to assess the level of CH₄ oxidation under field conditions.** Only specialized Stable Isotope (SI) based methods are capable of such a task. The costs, along with recent controversies concerning the SI based methods, necessitate the development of a new simpler test. Recently, there was also some push-back against relying on the Stable Isotope technique to quantify methane oxidation in landfill covers and in biocovers. It was argued that diffusive gas transport through soils can result in significant depletion in ¹³C. This is a result of the faster diffusive flux of the lighter ¹²CH₄ as compared to ¹³CH₄. The effect is increased with higher air-filled porosity and hence increased high diffusivity. Some even argued that these uncertainties may render the application of the stable isotope method for the quantification of the oxidation process very difficult.

One of such possible techniques, that our research team has been developing for field measurement of hydrogen sulfide attenuation capacity by landfill covers and biocovers is the Gas Push Pull Test (GPPT). We have obtained funding to fully investigate the potential use of the GPPT, construct a test pit to test the methodology under macro-scale conditions, and to be the only team in the USA with experience with such a test. The GPPT (Gas Push Pull Test) is a single well gas-tracer test. During the test, a mixture of inert tracer and reactive gases is injected (pushed) into the soil. The injected gases are then pulled from the soil allowing the estimation of the reactivity of different cover materials and different cover designs.

Proposed Activities: We propose to build on our recent experience with the GPPT to extend and modify the GPPT to allow for an alternate measurement of methane oxidation in the field beside the Stable Isotope. We plan to reach this objective through a series of test pit trials combined with field testing at the Leon County Landfill and Spring Hill Landfill.

Rationale: To date, the GPPT method has been used to determine rates of methane oxidation above a contaminated aquifer, in a peat bog, and only **TWICE** in landfill cover soils. All of the previous trials in the past have involved the use of acetylene as a methane oxidation inhibitor. This practice can severely hinder methane oxidation for months. We believe we have the capability to modify the GPPT and adopt it to replace the Stable Isotope technique without having to use inhibitors.