Methane Oxidation: Investigations of Methane Oxidizers and Methane/NMOC Emissions Mitigation Potential in Landfills

Session 1: Laboratory-Based Studies
Session 2: Field Studies

GOAL: Information about the extent to which methane oxidation occurs in landfills is important for two reasons: (1) methane oxidizers reduce methane and NMOC (non-methane organic compound) emissions from landfills; and (2) landfill methane oxidation is included in national emissions inventories, so that oxidized methane is subtracted from the methane production potential of landfilled waste.

The purpose of these sessions is to consider relevant findings from microbiological investigations of methane oxidizers and to assess data from laboratory or field experiments where methane oxidation is being exploited for new landfill cover design. Focused small group discussion will center on (a) how well laboratory and field microbiological studies can assess and predict oxidation, (2) how such studies can be used to guide cover and biofilter designs; and (3) how laboratory and field data can be used for managing hazardous landfill emissions and estimating landfill impacts on climate change.

SESSION APPROACH: An atmosphere of collegial exchange will be encouraged during the session proceedings. Presentations will be limited to 15 minutes, with 5 minutes for questions. An interval is also scheduled for poster presenters to introduce themselves and distribute some handouts related to their research. Sessions will also include two 30 minutes periods for guided small group discussions.

DISCUSSION: Small group discussions will be used to generate and exchange comments in response to the specific presentations and the broader session topic. Written questions will be provided (see below), additional verbal questions may be posed by the session chairs, and participants will be invited to pose questions for group discussion. One individual in each group will be requested to record and report a verbal summary of their group's deliberations. Discussion among the larger group audience will follow to focus on topics that emerge from the small groups.

SESSIONS OUTPUT:

A written summary of the session proceedings will be compiled by the session chairs. An outline draft of the summary will be available for verbal reporting at the conference closing, and a final written draft will be submitted to the conference organizers within two weeks of the conference closing date. A final summary will be prepared based on feedback received from the conference organizers. The summary will review the oral presentation topics and the discussion questions posed and provide an integrated overview of the participants' comments.

SESSION SCHEDULES:

Methane Oxidation Session I – Emphasis on Laboratory-Based Studies

Time	*Minutes*	*Author*	*Title*	*Abstract No.*
0.0	5	chair	Welcome and Introduction	
0.5	15+5	C. Scheutz	Biodegradation of trace gases in simulated landfill biocover systems	57sche
0.25	15+5	H. Hilger	Methanotroph biofilms in landfill cover soil	27hilg
0.45	5+5		**Posters outline –**	
		K. Mahieu	Isotope fraction by microbial methane oxidation: improved determination	41mahi
		R. Haubrichs	Engineering strategies for efficient methane oxidation in landfill cover liners and biofilters	26haub
0.55	30		Group discussion and summary	
1.25	15+5	S. Mor	Methane oxidation by compost: effect of temperature and moisture	47mor
1.45	15+5	D.-C. Seo	Estimation of methane oxidation in some materials for landfill cover or biofiltration	59seo
2.05	25 to 55		Group Discussion, Wrap-up	

Total about **2.30 – 3.00 hours**
(total time depending on general ICLRS session schedule)

Discussion Topics

- What is the current state of knowledge regarding the aerobic and semi-aerobic degradation of speciated NMOCs in landfill cover soils? What critical experiments need to be done at laboratory and field scale to better understand rates and controlling variables? How can we develop models for regulatory guidance, site design, and regional quantification of these processes?
- Is there a need for more information about the organisms responsible or the microbial ecosystems? If so, what new information would be most pertinent and why?
- Is there emerging clarity about the environmental factors that have the most potent effects on methane oxidizers in cover soil?
- How close are we to being able to reliably predict methane oxidation contributions based on climate and field site characteristics? How close do we need to be?
- Stable carbon isotopic methods (using the $\delta^{13}C$ of methane) are available for whole landfill methane oxidation measurements. Have these methods been sufficiently validated? Are there other isotopic or molecular techniques that could be exploited for whole landfill oxidation estimates for methane or other species?

Methane Oxidation Session II – Emphasis on Field Studies

Time	*Minutes*	*Author*	*Title*	*Abstract No.*
0.0	5	chair	Welcome and Introduction	
0.5	15+5	M. Barlaz	Evaluation of biologically active cover for mitigation of landfill gas emissions	05barl
0.25	15+5	R. Kettunen	Control of methane emissions from municipal landfills in subarctic zone	36kett
0.45	5	S. Dever	**Poster outline** - Biofiltration of landfill gas using recycled waste materials	16deve
0.50	30		Group discussion and summary	
1.20	15+5	J. Gebert	Landfill Methane Oxidation in a passively vented biofilter	22gebe
1.40	15+5	M. Chandrakanthi	Performance of Field-scale methanotrophic biofilters (MBFs) used to control point-source methane emissions: A numerical modeling approach	15chan
2.0	30 to 60		Group Discussion, Wrap-up	

Total about **2.30 – 3.00 hours**
(total time depending on general ICLRS sessions schedule)

Discussion Topics

- Based on our current knowledge about existing and optimum methane oxidation in landfill cover soils, is pursuit of enhanced methane oxidation warranted? What kinds of engineered systems can we envision that would optimize methane oxidation and oxidation of other gaseous hydrocarbons emitted through landfill covers?
- What factors can be identified that influence the performance of engineered biotic methane removal systems? Can these factors be manipulated or controlled?
- What is the perceived potential of such systems at this point, and what research questions need to be addressed in order to fully evaluate them?
- What regulatory issues are likely to be associated with engineered systems that promote methane oxidation, and what are the best ways to address such issues?
- Are there drawbacks to such systems that need to be addressed? What kind of operation/maintenance/regeneration are they likely to require?