

6. LFG Quantification and Modeling (English)

Methane to Markets

Modeling vs Measurement

- In U.S., modeling using U.S. EPA published default values, or assumptions based on experience at similar sites,
- Site specific data and/Limited field testing program consisting of an extraction *pump test* from either a single LFG extraction well or a limited number of wells in a portion of the site being tested, or
- A combination of the two.

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Methane to Markets

EPA Modeling

- LFG Flow = $k \times Lo \times \text{Exp}(-kt)$
- t = years
- k = rate factor yr^{-1}
 - Dry 0.02; AP42 0.04; NSPS Wet 0.05; Bioreactor up to 0.70
- Lo = methane yield per unit of mass
 - 100 cu m/kg = 1.6 cu ft/lb
 - 170 cu m/kg = 2.6 cu ft/lb
- C_{NMOC} (4,000 ppmv)

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Methane to Markets

Modeling

- Lo and k are never what the EPA suggests.
- At some sites this gets you close.
- Some sites the results are as much as an order of magnitude off.
- It is best to solve for Lo and k from other similar landfills.

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Methane to Markets

Relationship between Lo and k

- There are a number of combinations of Lo and k that can be used to predict LFG generated by a landfill.
- Can calculate k based on methane collection data from a closed section of a landfill. This allows the modeler to clearly see the methane decline with respect to time.

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Methane to Markets

LFG Extraction System Design Criteria (Extraction Wells)

Refuse Permeability	Horizontal to Vertical
▪ Design - Wet landfills	3:1
▪ Design - Dry landfills	5:1 – 10:1
▪ Measured (localized)	33:1

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Methane to Markets

Radius of Influence

- *Radius of influence* (ROI) field testing had been attempted to guide well spacing. One such method (EPA's Method 2E) has been published. However, such tests are costly and often difficult to interpret.
- ROI is more like an amoeba than a circle.

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6. LFG Quantification and Modeling (English)



Radius of Influence

- The Rules and Regulation Committee surveyed well design practices at over 58 United States landfills in 1991.
- It was found that nearly 60% of landfills used spacing of 200' or greater
- Some landfills use mixed spacing.

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Active System

- Flare Station: The facility at which the LFG is gathered and thermally destroyed.
- Recovery: The utilization of the LFG for productive purposes; can include power generation, low/high BTU fuel.
- If recovery system goes down, the flare starts so LFG continues to be burned.

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