Direct Emission Measurements on Cast Iron Pipe

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OVERVIEW

• Background
• Use of Hi-Flow Gas Sampler
• Second Study
• Going Forward
DTE Energy is one of the nation’s largest diversified energy companies.

Its largest operating units are Detroit Edison, an electric utility serving 2.2 million customers in SE Michigan, and MichCon, a natural gas utility serving 1.3 million customers in Michigan.

MichCon, founded in 1849, is the fifth largest natural gas utility.

MichCon is able to store 130 billion cubic feet of gas in naturally occurring underground rock formations.
What is the issue?

• Cast Iron Pipe Replacement Program – 2500 Miles in 50 Years
• Increased Focus on GHG – Should we use emissions to help us prioritize?
• Little Emissions Data is available on Underground Pipe
• GRI/EPA study dated June, 1996
• MichCon Needs Better Quality Data!
Why does cast iron pipe leak?

- Bell-and-spigot joints that connect pipe sections together tend to leak as pipe ages.

- Corrosion of pipe may also be an issue.
Factors Affecting Leak Rate - GRI/EPA Study

• Stratifying variables were identified as:
  – Pipe use (service versus mains)
  – Pipe materials
  – Pipe age
Factors Affecting Leak Rate - GRI/EPA Study

• Additional Factors:
  – System leak detection and repair programs
  – Pipe operating pressures
  – Distribution soil characteristics
  – Pipe diameter
EPA/GRI Test Procedure

- Leak was identified
- Segment to be tested was capped off at the service-to-main connection
- A short segment of main (20 feet long) with a detectable leak was isolated or
- A longer segment with multiple leaks was isolated
- Cast iron pipe was slightly different as many sections have undetected leaks
- Gas was metered to the section and the gas flow rate required to maintain pressure was recorded
- Separate work was completed on the oxidation of methane in soil
MichCon Emissions Study

• MichCon worked with Heath Consultants to establish a protocol for measuring leaks in underground pipe using a high-flow sampler.

• The study included:
  – Selection of several sites with different characteristics (similar to the GRI/EPA study)
  – Use of three different methods of enclosing leaks
Funnel Method
Issues associated with sampling

Funnel Method –
• Many did not produce any measured sample
• May have been issues with the seal to the ground
• May have been venting over a wider range – even at the curb
• Cannot be used on city streets
• Sampling could be improved with a much larger funnel
3-Hole Sampling Method
Direct Measurement – 3-Hose Sampling Method

• Produced results – but still not sure entire leak was captured

• Even with this method, not sure steady-state was reached and pooled gas was not being measured

• MichCon employees felt maybe gas was being pulled out of pipe
Tarp Enclosure Method
Issues Associated with Sampling

Tarp Enclosure Method –

• Need to test outside of tarp area to ensure all gas was captured
• Problems in areas between the curb and sidewalk
• Issues with seal to the ground
• Need a larger sample to adequately determine effectiveness
Leak Rate from Funnel Measurements

Leak Rate (cf/hr)

Leak Rate (cf/hr)
Cast Iron Pipe Emissions Data

- GRI/EPA – 238 Mcf/mile
- DTE – 21,595 Mcf/mile
Emissions Study

- As main services were renewed, service was transferred to the new main
- Meter was installed between the soon-to-be abandoned main and the existing system
- Gas to the isolated system was measured for 1.5 weeks to determine the leak rate
- One system – 0 gas leaks (580 feet)
- Second system – 16.7 cf/hr (1150 feet)
- Similar repair histories, etc.
Going Forward

• Additional main renewal emissions collection
• Better Repair History Tracking
• Additional Information on Leaks Collected
• Newer Technologies?
Any Questions?