

the Energy to Lead

Improving Methane Emissions Estimates for the Natural Gas Industry

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Need to Increase Efforts to Address Methane Emissions

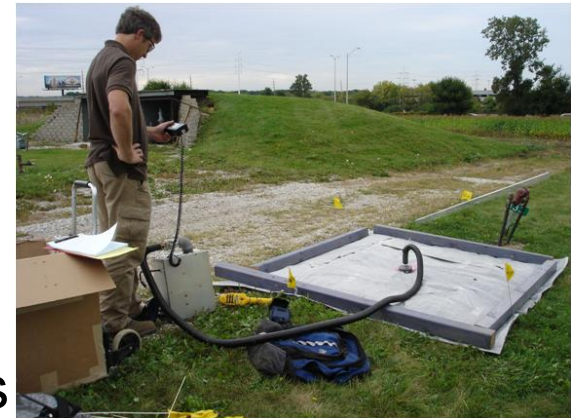
- > Administration releases climate action plan which includes reducing emissions from the gas industry
- > EPA Office of Inspector General: conducted an evaluation of what EPA has done to reduce methane emissions from distribution pipelines. Recommendations include:
 - EPA and PHMSA to work together to address methane leaks from a combined environmental and safety standpoint
 - Establish performance goals and track emissions from distribution sector
 - Assess whether data from current studies should be used to update emission factors. Work with research community to update the distribution sector emission factors

Benefits of GTI Methane Emissions and Detection Program

- > **Goal:** Facilitate the reduction of methane emissions by developing methods, processes and new technologies to detect, quantify and reduce emissions
- > **Safety:**
 - Enhance safety for employees, customers and general public through better detection of leaks and reduced emissions
- > **Environmental:**
 - Reduce GHG emissions and overall carbon footprint
 - Maintains social license to operate
- > **Economic:**
 - Prioritize leaks and repair
 - Reduces lost gas

Defining the Problem: More Accurate Emissions Information

- > GTI is:
 - **Developing a methodology for calculating methane emissions that will provide an increased level of accuracy**
 - Providing technical validation of methodologies and emission data
 - Coordinating work with AGA, EPA, and other appropriate stakeholders
- > Method is based on leak measurements made at the surface using current technology, Hi-Flow Sampler
- > Emission estimates will be based on leak rates and company specific leak records



Distribution Pipeline Emission Factors

> Value

- Current estimates for methane emissions are based on outdated data and practices. Improving emission factors will provide a more accurate representation of a utilities emissions profile and satisfy regulatory requirements of EPA requirements in 40 CFR Part 98 Subpart W



> Objective

- Collect field data from distribution pipeline leak rates to revise the emission factors for plastic pipe, cast iron and unprotected steel.



> Revised Emission Factors for Plastic Pipe

Revised Plastic Pipe EF	3.72 scf/leak-hr
GRI/EPA 1996 Plastic Pipe EF	12.45 scf/leak-hr

> Cast iron and unprotected steel: Collecting field data to revise emission factors

EPA OIG Report: Current Data Results in More Precise Emission Factors

Table 3 shows a comparison of the 1996 EPA/GRI and 2013 GTI study results. It compares number of samples, estimated leak rate for plastic mains, minimum leak rate measured, maximum leak rate measured, and the 90-percent confidence interval. It demonstrates that the 2013 GTI study design yielded a much smaller range with respect to the 90-percent confidence interval. Thus, the 2013 GTI study was more precise in its estimated leak rate for plastic mains.

Table 3: Comparison of study results for plastic mains

Study	Samples tested	Est. leak rate (scf/leak-hour)	Min. value (scf/leak-hour)	Max. value (scf/leak-hour)	90-percent confidence interval (scf/leak-hour)
1996 EPA/GRI	6	12.45 ^a	0.008	61.0	+/- 19.81
2013 GTI	22	3.72	0.600	14.4	+/- 1.41

Source: OIG analysis of (1) "Methane Emissions from the Natural Gas Industry, Volume 9 – Underground Pipelines," EPA and GRI, June 1996; and (2) "Improving Methane Emission Estimates for Natural Gas Distribution Companies, Phase II–PE Pipes," GTI, November 2013.

^a This leak rate is from the 1996 EPA/GRI study and does not reflect the EPA's 2005 adjustment to the plastic pipeline EF. The EPA uses the adjusted leak rate for plastic pipelines in the GHG Inventory and GHGRP.

Improvements made but additional data will improve accuracy

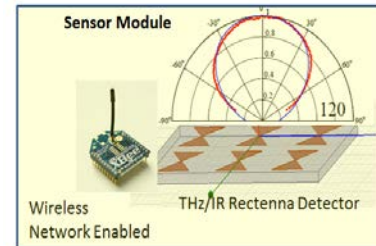
Prioritizing Leaks Based on Safety and Environment

- > Concentration of methane does not tell the entire story
- > Traditional leak survey equipment can be used to initially locate suspected leaks
- > Prioritize leaks based on safety and emission/leak rates
- > Allows for the optimization of methane emission reductions through leak repair and main/service replacement programs

OTD is developing an inexpensive and repeatable device that can provide a coarse measurement of the gas leakage rate in the field while investigating leaks on distribution piping.

Emerging Technology for Low Cost Methane Sensing

- > Better data collection and measurement of methane emissions will enable quicker emission reductions by:
 - Providing an accurate count of emissions
 - Ranking high priority sources
- > Low cost methane sensing technologies can enable wide spread deployment for all infrastructure assets
- > In collaboration with RedWave Energy, 3M and Desert Research Institute, GTI is developing a measurement system based on Terahertz (THz) technology to detect methane in conjunction with signal processing and advanced computational fluid dynamics (CFD) to estimate the location and intensity of methane leaks



Industry Needs and Next Steps for GTI and OTD

- > Continuous improvement in the quantification of distribution sector emissions to enable accurate utility level tracking of emission profiles
 - Build robust data set of leak emission characteristics to better quantify methane emissions
 - Implement utility specific methodology to establish baseline emission profiles and quantify subsequent reductions
- > Leak survey technology that will enable prioritization based on safety and environment
- > Continuous monitoring of leaks (e.g., high consequence areas)
- > Mapping of leak detection and repair
- > Real-time imaging of low ppm gas distribution leaks during leak surveys