

Temidayo Fasasi – MSc. Mechanical Engineering

Project: Single Blind Controlled Release Testing to Evaluate the Performance of a Methane Detection System.

Project Overview.

Methane is a potent greenhouse gas with a global warming potential significantly higher than carbon dioxide over a 20-year period [1]. Accurate detection and quantification of methane emissions are crucial for mitigating climate change impacts [2]. As such, single-blind controlled release testing is a method used to evaluate the performance of methane detection systems under realistic conditions without the testers knowing the exact release details during the test. In this study, the controlled release rig shown in Figure 1 was developed at the Methane Emission Technology Evaluation Center and used to execute the single blind controlled release testing. The objective of this research is to:

- ❖ Develop a hardware system (the controlled release rig, “Rig”) to test the capabilities of methane detection and measurement systems (“solutions”) at actual, operating facilities, and other remote locations.
- ❖ Use the Rig to perform independent, single-blind controlled release tests to assess the performance of the solution, in-situ.
 - Design a test specific to a particular methane monitoring solution.
 - Inform future design of a test protocol broadly applicable to a variety of methane monitoring solution.



Figure 1: (Left) conceptual CAD model; (Right) Controlled Release Rig as built, in use during testing.

Research Progress.

The field deployment was done at a site in south Texas shown in Figure 2. The single-blind controlled release test was executed and lasted for 54 days based on the predefined protocol. Data was collected and analyzed with the ground truth released emission and performance metrics were carried out to evaluate the solution's performance. Upon completing the analysis, the result shows 90 % Probability of reporting at 5.5 kg hr^{-1} and 50 % probability of report at 4 kg hr^{-1} . The solution performance improved with an increasing wind speed with the 90% probability coming to 4.4 kg hr^{-1} at a wind speed greater than 1 ms^{-1} and 3.8 kg hr^{-1} at 2 ms^{-1} respectively.

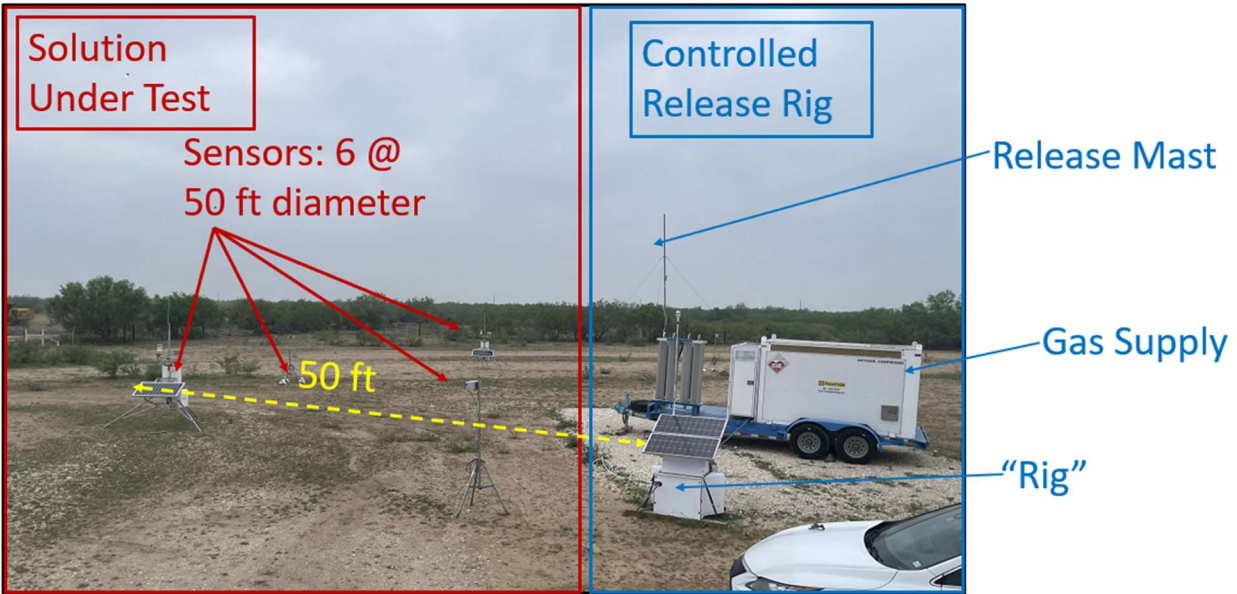


Figure 2: Filed deployment during the single blind controlled release testing: left side shows the solution under test with 50ft diameter around the controlled release rig, right side shows the Test center with the rig, release mast, and the gas supply.

Publications.

No publications yet.

Literature cited

1. Intergovernmental Panel on Climate Change (IPCC), Climate Change 2021 – The Physical Science Basis: Working Group I Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, 1st Edition, Cambridge University Press, 2023. doi:10.1017/9781009157896.

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2. Z. Chen, S. H. El Abbadi, E. D. Sherwin, P. M. Burdeau, J. S. Rutherford, Y. Chen,

Z. Zhang, A. R. Brandt, Comparing continuous methane monitoring technologies

for high-volume emissions: A single-blind controlled release study, ACS ES&T Air (2024)