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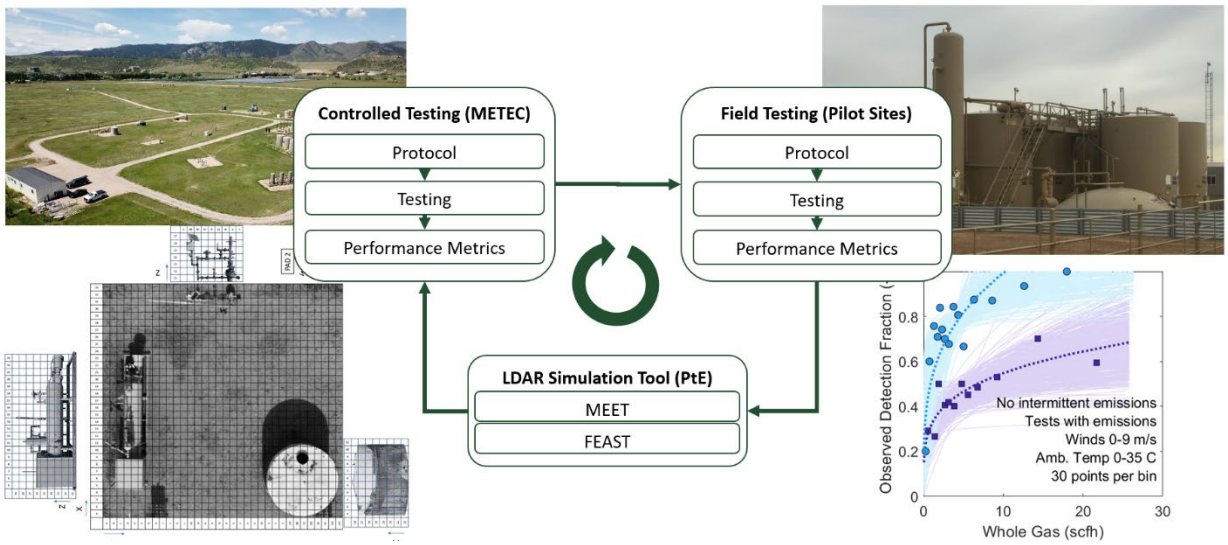


CURRENT PROJECT OVERVIEW

PROJECT TITLE: Advancing Development of Emissions Detection (ADED)

PROJECT GOAL: Accelerating natural gas leak detection and quantification solutions through transparent and rigorous scientific validation.

THE BIG PICTURE: Mitigating methane emissions is a serious concern globally. In the United States, multi-stakeholder efforts are driving the rapid development of new emission detection technologies that promise improved emissions reduction than established detection methods across the natural gas supply chain. The United State Environment Protection Agency (EPA) promulgated the implementation of structured and periodic leak detection and repair (LDAR) programs by oil and gas operators. LDAR is typically actualized using regulatory approved methods like EPA method 21 or optical gas imaging. For new leak detection and quantification solutions to be regulatory approved for LDAR and widely adopted in the industry, they must demonstrate equivalent or better control efficacy than existing methods. The need for a faster, systematic, reliable, robust, and cost-effective technology-independent process that achieves this objective as well as estimating the control efficacy of the approved solutions in LDAR programs to a reasonable accuracy inspired the Advancing Development of Emissions Detection (ADED) project.

The Advancing Development of Emissions Detection project will implement a comprehensive process of protocol development and testing to accelerate the adoption of natural gas leak detection and quantification (LDAQ) solutions by natural gas operators, and their approval by cognizant regulatory authorities. The project will (1) develop test protocols for LDAQ methods and perform controlled testing at CSU's Methane Emissions Technology Evaluation Center (METEC); (2) develop protocols for a field testing of solutions and conduct a comprehensive field trial of multiple LDAQ solutions on a variety of oil and gas facilities; (3) demonstrate methods to evaluate the control efficacy of LDAQ solutions using simulation software developed in funded, parallel

projects. The project will move a set of qualified LDAQ solutions through testing and demonstration, but the primary deliverable is to develop a process whereby any solution can move through testing and qualification. Deliverables include (a) testing protocols, and (b) demonstrating a process for testing, analysis, and adoption and/or regulatory approval. These steps are necessary for state or federal regulatory emissions programs to approve solutions or for operators to select solutions for internal emissions reduction programs. The project includes specific steps to engage oil and gas operators, LDAQ solution developers, regulators, and environmental NGOs. Most required participants have already been engaged in workshops and earlier testing, some operators have committed match funding for this proposal, and several solution developers have expressed their intent to participate. State and federal regulators have been, and will be, kept informed throughout the proposed work to provide feedback on testing protocols and processes, with the goal of accelerating approval of solutions.

MY PIECE OF THE PUZZLE: The controlled testing phase of ADED aims to establish controlled testing protocols to characterize the performance of a variety of leak LDAQ methods. Some of the deliverables of this phase of the study are to (1) develop a comprehensive test protocol; (2) assess the robustness of the test protocol and deduce areas of improvement and development for further controlled testing campaigns; (3) determine key parameters to evaluate effectiveness (i.e., detection curve, quantification accuracy and precision, etc.). One of the most significant elements of results from this phase of the study is the Probability of Detection (PoD) curve, a more robust representation of detection than minimum detection limit (MDL) or lower detection limit (LDL), and the primary metric needed to simulate emissions mitigation potential in models like FEAST and LDAR-Sim. Ultimately, these metrics feed into the simulation models as part of ongoing parallel projects for evaluating equivalency of LDAQ solutions and integration into regulatory or responsible gas programs. The field-testing phase of the ADED study aims to evaluate if the PoD and other metrics evaluated in controlled testing are indicative of performance of LDAQ solutions in real facilities. The collective goal of all projects is to demonstrate equivalence by developing a system that effectively predicts how methods characterized by the ADED project will affect/improve O&G companies leak detection and repair (LDAR) programs in a faster and repeatable manner.

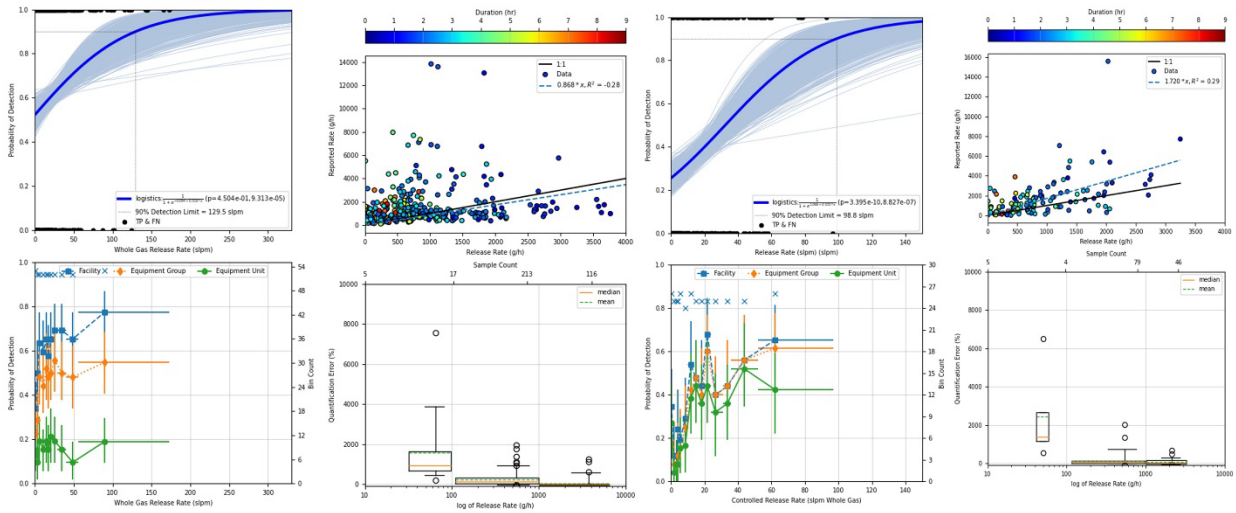
RESEARCH PROGRESS

The controlled testing phase of the ADED project and other parallel projects are concurrently ongoing now. The controlled testing focuses on two categories of solutions: continuous monitoring (CM) and survey solutions. Thus far the second campaign of the CM controlled testing is over, and the result of individual participants have been computed, revised, and issued to them all. However, the quality of test results is still being reviewed to improve quality while alternative result analysis methods and variations of the protocol are being explored. The first campaign of survey testing is also complete and preparations for the second is currently on. My role in the projects has been to drive controlled release testing at METEC by designing and scheduling experiments while keeping track of the performance of participating solutions as we progress. I have reconciled existing test result analysis codes to ensure it follows the ADED protocol correctly and support through troubleshooting, modifications, and relevant additions. Presently, I am involved in the test protocol review while also drafting a paper to be published on the controlled test result of CM systems. In the paper, among other relevant information, I will attempt to capture alternative ways (which does not necessarily follow the test protocol) through which the result can

be viewed. Ultimately the result from this phase of the ADED study will characterize the LDAQ solutions and assess the reliability of the test protocol while the field campaign qualifies the test protocol.

Blinded results from some participating solutions

Disclaimer: This is not the most recent result, it just an illustration of some performance metrics investigated



Solution A – Network of Point Sensors

Solution B – OGI based solution

RESEARCH PLANS

1. Complete the ADED continuous monitoring controlled-testing paper and send it out to be peer-reviewed.
2. Complete the analysis of the recently qOGI study, review the results with the study team on the way forward, then work on a paper based on the results from the study
3. Compute the result on the concluded survey about the O&G industry operator's experience on the use of LDAQ solutions and start drafting a white paper on my findings.

Publications

None yet.

Literature/Sources cited

https://energy.colostate.edu/metec/aded/
https://netl.doe.gov/sites/default/files/netl-file/21CMOG_OG_Zimmerle.pdf
https://www.arvindravikumar.com/feast