DOT PHMSA Public Quarterly Report

Date of Report: 10th Quarterly Report Ending March 31, 2025
Contract Number: 693JK32210004POTA
Prepared for: USDOT PHMSA
Project Title: Advancing Hydrogen Leak Detection and Quantification Technologies Compatible with Hydrogen Blends
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For quarterly period ending: March 31, 2025

1: Items Completed During this Quarterly Period:

The 10th Quarterly Status Report, Determining Field Testing Locations and Sensor Development Activities were all accomplished this quarter and were drawn from Attachment #3, Technical and Deliverable Payable Milestone Schedule (in the contract) from the sixth payable milestones. These items were completed during this reporting period and are the corresponding items included on our next invoice.

2: Items Not Completed During this Quarterly Period:
Nothing to report.

3: Project Technical Status:

ACTIVITY: LABORATORY TESTING

Item Title: Complete laboratory testing
Item Number: 10
Task Number: 4

Laboratory testing continued into this quarter. All instruments needed for testing have been received and calibrated properly so that laboratory testing can finish in full in Q2 of 2025. In addition, all necessary gas mixtures for pure methane, lowered methane concentrations, and methane-hydrogen blends have been procured by the project team. Sensor testing at SENSIT has been nearly completed with a hydrogen-specific catalytic device still needing to be tested in early April.

At GTI Energy, laboratory testing on pump-based devices has progressed well, with a second round of testing having been accomplished with added bump gas tests in between full-scale testing at the gas mixtures shown in Table 1.

Table 1. Gas Mixtures Used for Laboratory Testing by Hydrogen Percentage

Hydrogen Percentage	Methane Concentration (ppm)	Hydrogen Concentration (ppm)
0%	10	0
	1,000	0
	5,000	0
	25,000	0
	100% Methane	0
5%	9.5	0.5
	950	50
	4,750	250
	23,750	1,250
10%	9	10
	900	100
	4,500	500
	22,500	2,500
20%	8	2
	800	200
	4,000	1,000
	20,000	5,000

Data analysis is still pending on the re-tests being done for the previously listed instruments. The project team has also been completing free-flow testing with and without a regulator on selected instruments. A preliminary data analysis on the results from this expanded testing can be seen in the following section. Laser testing is also still ongoing for the full-scale devices. There will be two elements to the laser testing, one on Tedlar bags at a range of concentrations similar to Table 1, and on free flow plume measurements from pre-mixed blends at a range of flow rates. A Tedlar bag testing setup has been created where struts hold the bag in place with a carboard background situated behind the Tedlar bag.

ACTIVITY: STATISTICAL ANALYSIS

Item Title: Complete Statistical Analysis
Item Number: 22
Task Number: 7

Based on the results to date, many of the tests that have been re-ran show very little within-group variability of concern and that there is less frequency of an exact value being observed repeatedly across different methane and hydrogen concentrations. For the combustible gas indicators, some of them show signs of being influenced by hydrogen concentrations in that the proportion of combustible gas detected is lowered somewhat. However, at 25000ppm one CGI device showed that there was little evidence of any interaction between combustible gas concentration level and relative hydrogen concentration level.

A second CGI device and its proportions detected were found that both combustible gas concentration level and relative hydrogen concentration levels impacted the maximum proportion of combustible gas detected. Testing and analysis are still ongoing to better determine the causes of the differences between the CGI devices.

For non-CGI devices, most of them could not find a statistically significant interaction between methane concentration level and relative hydrogen concentration level – especially at higher concentrations. There is still a need to complete all the planned tests to properly determine all of the possible impacts.

Data analysis will be completed in earnest in the coming months and be integrated into the final report that will expand on the possible impacts hydrogen plays in both CGI and non-CGI instruments depending on their internal sensor profile.

ACTIVITY: FIELD TESTING

Item Title: Determine field testing locations
Item Number: 14
Task Number: 6

The third and final field test was completed in March 2025 after the first two field tests for various hydrogen blends were accomplished in Q2 and Q3 of 2024. A Hi-Flow sampler was used to help estimate leak rate beyond the capabilities of the sponsor's training facility with the number of indications and maximum concentrations being documented from each of the devices.

The field test accomplished this quarter was primarily focused on small, marginally detectable underground leaks with a secondary focus on above-ground meter sets and appliances. Survey instruments, open path laser-based instruments, combustible gas indicators were used to provide multiple data points on each leak investigation at the LDC's training facility. In addition, a Hi-Flow 2 was brought along to validate the flow rate measurements of different leaks that the LDC was able to simulate underground.

The leaks were created around 3-4 feet underground and were mixed using the H2Scan instrument, The ground conditions were not ideal for establishing leaks with marginal detection and forced the project team to run leaks for several hours before being able to detect gas. This highly saturated ground coupled with little to no flow expression made it difficult to detect leaks with the laser-based instruments. This information will help to better contextualize the data amidst the results from the previous two field campaigns. The full results from the field campaigns and statistical analysis will be integrated into next quarter's quarterly report.

ACTIVITY: TENTH QUARTERLY STATUS REPORT

Item Title: Submit Tenth Quarterly Status Report
Item Number: 19
Task Number: 8

The tenth quarterly status report (this report) will be completed and submitted to PHMSA's PRIMIS server in both public and internal-facing formats

ACTIVITY: PROJECT MANAGEMENT

Item Title: N/A
Item Number: N/A
Task Number: 8

During this quarter, GTI conducted project scheduling, budgeting, establishment of data management strategies, preparation of reports, and organization of required meetings. And secured further field testing with SoCal Gas.

5: Project Schedule:

The project schedule is shown below in Table 2 with the submittal time of this quarterly report outlined in red.

Table 2. Project Schedule

Task	Description	Q4 2022	Q1 2023	Q2 2023	Q3 2023	Q4 2023	Q1 2024	Q2 2024	Q3 2024	Q4 2024	Q1 2025	Q2 2025	Q3 2025
1	Project Scoping and TAP												
2	Literature Review												
3	Develop Evaluation Plan												
4	Laboratory Tests												
5	Develop New Hydrogen Sensing Schemes												
6	Field Tests												
7	Statistical Analysis and Final Report												
8	Project Management												