PROJECT CANARY

ROUND 3 METEC TESTING RESULTS

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Project Canary (PC) presents the results of its third series of field testing of methane and VOC emissions from Colorado State University's Methane Emissions Technology Evaluation Center (METEC). The main purpose of this round of testing is to continue improving our quantification analytics platform to localize emitting sources accurately and calculate their emission rates. We deployed eight Canary X sensors and Project Canary's analytics platform to localize and quantify these unknown leak rates. Results show a cumulative flux error of -4.99% over 45 experimental methane releases.

In the third round of METEC testing, our quantification models were improved upon from their previous iterations. We have employed new methods for filtering, background calculation of methane, and data post-processing, among other new features. For example, the grouping of experiments mitigates the effect of outliers by providing a normal-like distribution of fluxes. A normally distributed set of fluxes improves averaging since there will be more samples, and the outliers will receive less weight.

Our results demonstrate that the addition of these statistical methods improved the accuracy of the quantification algorithm.

Figure 1 METEC R3 Test Pad

The METEC Round 3 field-testing campaign included 45 experimental conditions (over a continuous 5-day period) of methane releases from leak sources surrounded by eight Canary X methane sensors, as shown in **Figure 1**. Each experiment lasted 60 minutes and was repeated three times for the reproducibility of results. The controlled methane releases ranged from ~ 4 to 400 scfh (~0.023-2.18 g/s). This range of leak rates was selected to represent average well pad emissions at a site with small to more significant leak rates.

The Project Canary dashboard serves as a visualization tool for the time series of the hourly aggregated statistics of concentration, wind speed, and wind direction from all detectors and weather

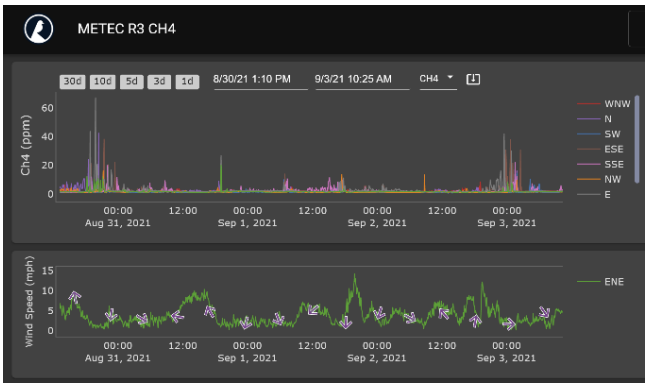

Figure 2 Project Canary Real-Time Dashboard

sensors. The dashboard enables the user to assess detector engagement and adjust the experimental setup, if necessary, to maximize the alignment of sensors with the dominant directions of methane dispersion with respect to the prevailing wind, as shown in **Figure 2.**

The percent cumulative error of flux calculation accuracy of the Model Ensemble for Round 3 was -4.99% compared to -6.36% for Round 2, as shown in **Figure 3.** Round 3 also saw an improvement of 4% in relative error and 0.02 g/s in absolute error

compared to Round 2. This demonstrates that recent algorithm improvements have resulted in reductions of cumulative, relative, and absolute errors.

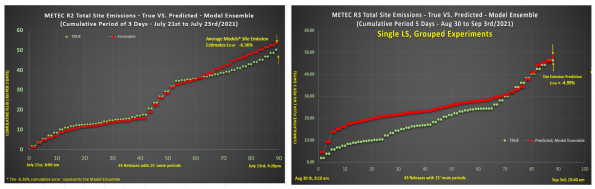

Figure 3 Cumulative Flux Prediction Error from R2 and R3

The Project Canary dashboard in **Figure 4** shows the testing version of the quantification dashboard, including novel features, such as the leak rate, source location, and heat map of emitting sources.

Moving forward, Project Canary will continue to improve the quantification analytics platform and dashboard in response to customer needs, including further METEC testing representative of midstream facilities and testing cutting-edge analytical methods to solve this problem.

Figure 4 Quantification Testing Dashboard