



OFFICE OF AIR QUALITY PLANNING AND STANDARDS
RESEARCH TRIANGLE PARK, NC 27711

3/14/2025

Mr. Eric Wen
Qube Technologies Inc.
632 Confluence Way SE, Suite 300
Calgary, Alberta Canada T2G 0G1

Dear Mr. Wen:

We are writing in response to your submission on behalf of Qube Technologies Inc. (Qube), located in Calgary, Alberta, dated January 10, 2025, in which you request the approval of an “Alternative Test Method for Methane Detection Technology” under the New Source Performance Standards for Crude Oil and Natural Gas Facilities for which construction, modification or reconstruction commenced after December 6, 2022 (40 CFR Part 60, Subpart OOOOb). We are considering this request under 40 CFR [60.5398b\(d\)](#), based on the information you have submitted (as described below). The EPA’s Office of Air Quality Planning and Standards has been delegated certain authorities under this provision, including authority to consider and/or approve alternative test methods for methane detection technology.

As we understand, Qube, has developed a measurement solution, Qube Emissions Monitoring System, which is a network of fixed devices on a site that measure gas concentration and environmental data and uses that data in physics-based models to convey that information into leak locations and quantities.

To support your submittal, you have provided the following documents associated with your submission, either submitted through [EPA’s publicly facing portal](#) or through EPA’s Confidential Business Information (CBI) Office when a CBI claim was made:

- Executive Summary documents submitted January 10, 2025: the documents is a publicly facing portal submission that describe submission information, technical summary of the technology, summary of documents submitted and additional contextualizing information. See [§60.5398b\(d\)\(2\)](#) and [§60.5398b\(d\)\(3\)\(i\)-\(ii\)](#).
- Description of Technology document submitted on January 10, 2025, which is a publicly facing document that describes that details the relevant measurement technology

including measurement theory, instrumentation, application, and known limitations. Qube supplemented the publicly facing document with additional documentation claimed as Confidential Business Information (CBI) submitted on January 10, 2025 (and updated on March 4, 2025), which includes further claimed proprietary information and data regarding how the technology works. See [§60.5398b\(d\)\(3\)\(iii\) and §60.5398b\(d\)\(3\)\(iv\)](#).

- Publications and reports, listed below, were submitted through references in the description of technology document on January 10, 2025. Additional data and reports included in Qube's supplemental description of technology document, claimed as CBI, were also received on January 10, 2025. These third-party reports serve as supporting evidence that Qube can appropriately detect methane emissions at the 5 kg/hr, 10 kg/hr, and 15 kg/hr thresholds. See [§60.5398b\(d\)\(3\)\(vi\)\(A\)](#).

- Bell, C. et. al. 2023, Performance of Continuous Emission Monitoring Solutions under a Single-Blind Controlled Testing Protocol Environ. Sci. Technol. 2023, 57, 14, 5794–5805 <https://doi.org/10.1021/acs.est.2c09235>

Note: Identified as "Solution A"

- Highwood Emissions Management, "Qube Technologies Continuous Monitoring Probability of Detection: Results from independent single-blind controlled release testing," August 2022. [Online]. Available: https://highwoodemissions.com/wp-content/uploads/2022/09/2022-08-25_Qube-Probability-of-Detection-White-Paper.pdf
 - Highwood Emissions Management, "Alt-FEMP Performance Report: Enhance Energy and Qube Technologies Single-Operator Pilot," March 2023. [Online]. Available: <https://static.aer.ca/prd/documents/about-us/femp-enhance-alt-report.pdf>
- A sampling protocol titled "Methane Alternative Test Method – Qube Technologies Periodic Screening System." EPA received the final version on March 12, 2025, which includes all the required procedures and applicable quality assurance and control requirements, consistent with your operation of the solution, and consistent with the requirements in [§60.5398b\(d\)\(3\)\(vi\)\(C\)](#).

EPA conducted an initial review of the submitted material. Based on this review and receipt of additional information and consistent with the requirements in [§60.5398b\(d\)\(1\)\(i\)](#), EPA determined your submission to be complete on March 12, 2025.

Based on a review of the provided material and a recognition that Qube Technologies, Inc. meets the criteria found in [§60.5398b\(d\)\(2\)](#), we have determined that your Qube Emissions Monitoring System meets the periodic screening requirements for 5, 10, and 15 kg/hr detection

thresholds. Additionally, we are approving your solution for use by an owner or operator, on an affected facility, subject to the caveats included in the protocol, for the alternative periodic screening process as described in [§60.5398b\(b\)](#).

Furthermore, the Qube emissions monitoring system may be used as an alternative to fugitive emissions monitoring under the New Source Performance Standards for Crude Oil and Natural Gas Facilities for which construction, modification or reconstruction commenced after September 18, 2015, and on or before December 6, 2022 (40 CFR Part 60, Subpart OOOOa) provided the owner or operator using the solution complies with [§60.5398b](#), including the notification, recordkeeping, and reporting requirements outlined in [§60.5424b](#).

EPA has created a docket EPA-HQ-OAR-2024-0619 and is making the relevant documents mentioned in this letter publicly available there (except for information which has been claimed as CBI). Additional material developed by EPA to justify these decisions is also attached to this letter.

Because the alternative method may be used by owners and operators subject to the monitoring of fugitive emissions components affected facilities, and inspection and monitoring of covers and closed vent systems subject to 40 CFR part 60, Subparts OOOOa and OOOOb, we will post this letter as **MATM-008** on the EPA website at <https://www.epa.gov/emc/oil-and-gas-alternative-test-methods> for use by interested parties.

This approval letter is not an implied or express endorsement by EPA of any specific companies or products, as EPA does not promote the products, services, or enterprises of non-federal entities. This letter may be freely distributed and used for non-commercial, scientific and educational purposes. The use of the official EPA Seal and Logo is intended for US Government purposes only and may only be reproduced and used with the express, written permission of EPA's Office of Public Affairs. Further, the EPA Seal or Logo may not be used in a way that implies an EPA endorsement.

If you should have any questions or require further information regarding this approval, please contact my staff at MethaneATM@epa.gov.

Sincerely,

**KIMBERLY
GARNETT**

Digitally signed by
KIMBERLY GARNETT
Date: 2025.03.14
15:42:45 -04'00'

for Steffan M. Johnson, Group Leader
Measurement Technology Group

CC:

Greg Fried, OECA/AED
Elizabeth Leturgey, OECA/OC
Ned Shappley, OAQPS/AQAD
Karen Wesson, OAQPS/AQAD
Regional Testing Contacts

Attachments (2)

Qube Alternative Test Method (MATM-008).pdf

Memo to Docket - Acceptance Justification: Qube Emissions Monitoring System

MEMORANDUM

TO: EPA-HQ-OAR-2024-0619

FROM: Ned Shappley, EPA

DATE: March 14, 2025

Subject: **Acceptance Justification: Qube Technology Emission Monitoring System (Technology)**

This memorandum summarizes EPA's consideration of the technical basis of Qube Technologies Inc. (Qube), approach for their periodic measurement solution, called the Qube Emissions Monitoring System, documented in ALTECH-78, 79, and 80. Qube initially submitted on January 10, 2025, as part of the Advanced Methane Detection Alternative Test Method program (40 CFR 60.5398b(d)). EPA's consideration of this technology as a periodic measurement solution under this program and its application to the Advanced Methane Detection Alternative Test Method program is further described in EPA's approval letter dated March 14, 2025. This Memorandum also includes a summary of meetings between the company and EPA staff related to the company's request for approval of this technology.

According to the company's Description of Technology document, the Qube emissions monitoring system is a network of fixed devices on a site designed to detect, locate, and quantify methane emissions in real time. The technology consists of three components: (i) an Industrial Internet of Things (IIoT) device houses various sensors that measure gas concentration and environmental data and transmits this data to the cloud, (ii) a cloud-based platform records and analyzes data received by the IIoT device and uses physics-based models to convey device data into leak locations and quantities, and (iii) a web-based dashboard aggregates critical insights such as emission rates (e.g., block averages) and alarms generated by the platform. The detailed description of the components included in this document meet the requirements included in *§60.5398b(d)(3)(iii)*.

The Qube IIoT device house a metal oxide sensor (MOS) for the determination of the methane concentration and additional environmental sensors (e.g., anemometer) to assist with their physics-based modeling. The use of MOS sensor for methane measurement is relatively common; however, these sensors are prone to drift due to environmental factors and age. To address this drift concern, Qube calibrates each sensor individually to compensate for a wide range of operating conditions (e.g., temperature and relative humidity) and their IIoT device includes the needed environmental sensors to

make those compensations in real time. To account for any aging factors, Qube also developed a claimed propriety auto-baseline process to minimize sensor drift. Qube incorporates several quality assurance and quality control (QA/QC) checks for all environmental sensors to ensure accuracy and reasonableness of these sensor to ensure the accuracy of for their use in Qube's physic-based models for quantification of methane. EPA reviewed the calibration and QA/QC processes and concludes that they are sufficient to meet the requirement in *§60.5398b(d)(3)(vi)(B)*, and it finds Qube's approach for handling the known sensor drift in MOS sensor to be novel and effective.

Consistent with the requirements in *§60.5398b(d)(3)(vi)*, Qube provided EPA with multiple third-party validation reports to demonstrate their system could achieve their target sensitivity levels of 5 kg/hr, 10 kg/hr, and 15 kg/hr. The first report was a white paper developed by Highwood emission management company from a single-blind controlled release study¹. This study was performed over a few months with 29 days of active measurements in Winter/Spring of 2022 with releases occurring from approximately 50 , 75, and 100 meters from a release point. In favorable wind conditions, the results of this program indicated a 90% probability of detection (POD) for approximately 2 kg/hr for all distances. The second report, titled, Performance of Continuous Emission Monitoring Solutions under a Single-Blind Controlled Testing Protocol² developed Colorado State's Methane Emissions Technology Evaluation Center (METEC). This study was performed from between February and May of 2022. The METEC facility was designed to mimic and simulate a wide range of emission scenarios associated with upstream and midstream natural gas operations. The facility was built using surface equipment donated from oil and gas operators. A controlled release system allowed metering and control of gas releases at realistic sources such as vents, flanges, fittings, valves, and pressure relief devices found throughout equipment. The result of this program indicated a 90% POD when compared to emission rate of 6.9 kg/hr. When favorable wind conditions are considered, the study³ found the 90% POD to be 1.5 kg/hr. EPA thoroughly reviewed these reports and find them sufficient verification of the sensitivity of their technology as required in *§60.5398b(d)(3)(vi)(A)*. While the 90% POD when compared to emission rate in the METEC study exceeds the lowest requested threshold of 5 kg/hr, EPA considers the favorable

¹ https://highwoodemissions.com/wp-content/uploads/2022/09/2022-08-25_Qube-Probability-of-Detection-White-Paper.pdf

² Bell, C. et. al. 2023, Performance of Continuous Emission Monitoring Solutions under a Single-Blind Controlled Testing Protocol Environ. Sci. Technol. 2023, 57, 14, 5794–5805 <https://doi.org/10.1021/acs.est.2c09235>

³ Bell, C. et. al. 2023, Performance of Continuous Emission Monitoring Solutions under a Single-Blind Controlled Testing Protocol, Supplemental Continuous Monitoring Final Report, METEC, Performer A, February 24, 2023

wind conditions to be the better metric for comparison based on how the Qube systems are applied in the current alternative test method.

Qube's final alternative test method developed by the company and based on comments from the EPA, mirrors reasonably matches how data was collected during the third-party validation report, is sufficient for use for compliance in the oil and gas sector, and includes all the information as required in *§40 CFR 60.5398b(d)(3)(vi)(C)*. The method includes critical practices such as the siting of the individual sensor nodes, installations, registration, and confirmation steps. The method includes sufficient information to allow a user to understand the data collection through data reporting phase. The method also includes sufficient QA/QC of the sensors to ensure when valid data is being collected and potential corrective actions are needed. Additionally, Qube includes several reasonableness checks to allow trained Qube personnel to continually evaluate the processes and make any necessary changes in equipment. Finally, the method is written to include sufficient recordkeeping of their procedures that would allow a third-party (*e.g.*, state regulatory authority) to audit Qube's processes.

Finally, Qube requested their solution be approved broadly across all basins in the continental United States. The justification for the broadly applicable request is based on eight (8) case studies included in the Description of Technology document. These case studies were conducted at sites in the Permian basin, Haynesville basin, Piceance basin, and Northeast British Columbian basin (Canada). In each of these case studies, Qube demonstrates their system's ability to pick up different leak rates and sizes from different type of equipment failures and leaks and was able to demonstrate the system's response as repairs are made. Qube's case studies are sufficient evidence that their measurement system has performed effectively in different geographical and environmental conditions. EPA agrees with Qube's assertions that should be broadly applicable and has not included any basin restriction in the alternative test method letter.

Meeting Summary between EPA Measurement Technology Group and Qube Technologies Inc.,

Date	Venue	Participants	Topics
2024-05-29	Teams Call	Ned Shappley, Hannah Halliday, Paul Van Rooy, Dave Nash, Alex Macgregor, Eric Wen	Introductory Call, General review of Qube Technologies
2024-10-14	In-person CH4 Connection	Ned Shappley, Hannah Halliday, Dave Nash, Alex Macgregor, Eric Wen, Karen Marsh, Gretchen Kern	Discussion on continuous measurement application ⁴ and potential periodic screening application.
2024-11-12	Teams Call	Ned Shappley, Hannah Halliday, Alex Macgregor, Eric Wen, Karen Marsh, Gretchen Kern	Provide feedback on continuous measurement application and continued discussion on potential periodic application
2024-12-20	Teams Call	Ned Shappley, Hannah Halliday, Alex Macgregor, Eric Wen, Karen Marsh, Gretchen Kern	Additional feedback on potential periodic application
2025-1-03	Teams Call	Ned Shappley, Hannah Halliday, Alex Macgregor, Eric Wen	Additional feedback on potential periodic application
2025-1-22	Teams Call	Ned Shappley, Hannah Halliday, Alex Macgregor, Eric Wen	Feedback on initial review of periodic application, detailed discussion on sensor siting
2025-2-11	Teams Call	Ned Shappley, Hannah Halliday, Alex Macgregor, Eric Wen	Discussion regarding potential revisions to method language, request for supplemental data in the description of technology document.
2025-3-03	Teams Call	Ned Shappley, Hannah Halliday, Alex Macgregor, Eric Wen	Check-in call on method language revisions
2025-3-11	Teams Call	Ned Shappley, Hannah Halliday, Alex Macgregor, Eric Wen	Check-in call on method language revisions

⁴ Qube had previously submitted a separate application on July 25, 2024, for their continuous measurement solution, documented in ALTTECH-40. EPA is not acting on that application at this time.