



EPA Issues Final Requirements for Using Optical Gas Imaging in Leak Detection (Appendix K)

Applied to Leak Detection Surveys at Natural Gas Processing Plants

Technical Fact Sheet

- December 1, 2023 — The U.S. Environmental Protection Agency (EPA) has issued a final rule that will secure major climate and health benefits for all Americans by sharply reducing emissions of methane and other harmful air pollution from the oil and natural gas industry.
- The rule includes final updates to the protocol for using optical gas imaging (OGI) for leak detection. The protocol is referred to as “Appendix K” to 40 CFR part 60. OGI uses an infrared camera to identify the presence and location of volatile organic compounds (VOC) and methane leaks that may otherwise be invisible.
- The requirement to use Appendix K for OGI surveys will apply at natural gas processing plants. Appendix K may be applied to other sectors in the future if it is specified in future rulemaking actions.
- The final Appendix K contains requirements for:
 - The performance of infrared cameras.
 - Operator training and auditing.
 - Developing operating envelopes that define the boundary conditions for using an OGI camera.
 - Monitoring plans for conducting OGI surveys.
 - Recordkeeping.
 - Development of response factors.

Final Requirements

After carefully considering public comments on the December 2022 Supplemental Proposal, EPA is updating the following final technical requirements for Appendix K:

Operator Standards

Senior OGI Camera Operator Requirements

- The final protocol defines “senior OGI camera operator” as operators who have logged 1,400 survey hours during their career, including 40 hours in the past 12 months, and who have developed or completed the classroom training. Senior OGI operators who performed monitoring as part of initial field training, retraining, or while auditing other

operators could include those monitoring hours in determining senior OGI camera operator classification.

Training

- The final protocol requires OGI operators to complete initial classroom training followed by refresher training every two years. The training can be online or in person. Initial field training with a senior OGI camera operator must last at least 30 hours, followed by a final field test lasting at least two hours. The field training requirements allow for 10 percent missed leaks if there are 10 or more leaks total during the final field test.

Audits

- In the final protocol, EPA revised the audit requirement for OGI camera operators. OGI camera operators must complete a two-hour audit two times a year, either by comparative monitoring or video review, rather than quarterly, which the Agency had proposed. Operators who do not pass the audit must be retrained.

Previous Experience

- Operators with previous classroom training are not required to take the initial classroom training. However, operators will have to take biennial classroom training if they took the previous classroom training more than two years before Appendix K is finalized.
- Operators with previous field experience may be eligible to complete the retraining requirements in lieu of completing the initial field training requirements. Retraining consists of eight survey hours with a senior OGI camera operator conducting side-by-side surveys, eight hours of independent survey performance observed by a senior OGI camera operator, and a final monitoring survey test.

Inactive Operators

- OGI camera operators who have been inactive for more than 12 months must complete the retraining requirements prior to conducting surveys.

Requirements for Using OGI Cameras

Conducting Surveys

- Each site must have a monitoring plan that describes the procedures for conducting a survey, including daily verification checks, regular verification of site conditions, method for monitoring all regulated components, documentation required for surveys, and quality assurance videos for OGI camera operators.
- The final action requires 5-minute rest breaks every 30 minutes for all OGI camera operators to reduce physical, mental, and eye fatigue.

Dwell Time

- Dwell time is the time required to survey a scene to provide adequate probability of leak detection. Dwell time is the active time the operator is looking for potential leaks and does not begin until the scene is in focus and steady.
- The final protocol includes a dwell time of 2 seconds per component in the field of view.

- In addition, instead of finalizing a table that tied dwell time to the size of the area and number of components as a method for reducing dwell time, EPA developed a definition for a “simple scene.” The final protocol defines a simple scene as a scene with 10 or fewer components in the field of view. The OGI camera operator is only required to dwell on a simple scene for 10 seconds.

Operating Envelope

- An operating envelope is the range of conditions (i.e., wind speed, delta-T, viewing distance) within which a survey must be conducted to achieve the quality objective. Delta-T is the difference between the emitted gas temperature and the surrounding background temperature.
- The final protocol adds an option for a daily field check for maximum viewing distance for cases:
 - Where an operating envelope has not been developed for an OGI camera model or
 - When an OGI camera operator needs to expand an operating envelope to account for site-specific conditions.
- The daily field check must be completed prior to conducting a monitoring survey and must be repeated if the wind speed at the site increases or if the OGI camera operator cannot maintain the delta-T above the delta-T that was used in the first daily field check.

Documentation

- OGI camera operators have the flexibility to use either a video clip or a photo to document a leak. OGI camera operators could also use full videos in place of clips.
- The final rule includes recordkeeping requirements for OGI camera verification, operating envelopes, monitoring plans, training, audits, monitoring surveys, and OGI camera maintenance. Certain records do not need to be kept onsite but must be readily available if requested.

OGI Camera Standards

Camera requirements

- EPA’s final rule requires that an OGI camera must be capable of detecting methane emissions of 19 grams per hour and either:
 - Butane emissions of 29 grams per hour; or
 - Propane emissions of 22 grams per hour.
- The final requirements allow initial camera certifications and “operating envelope” determinations to be conducted by the owner or operator, the camera manufacturer, or a third party.

Response Factors

- Response factors are used to determine the camera’s ability to detect fugitive emissions by gauging the ability of the OGI camera to see the compounds contained in the gaseous emissions.

- Annex 1 to Appendix K contains procedures for developing response factors for OGI cameras. Response factors can also be obtained from peer-reviewed articles.

For More Information

- [Read the final rule and additional fact sheets.](#)