

Leak Detection

Program Description

This strategy to reduce ambient ozone levels within the non-attainment area (NAA) involves modifying Colorado Air Quality Control Commission Regulation No. 7 (Reg. 7) regarding detection and repair of fugitive leaks by considering one or more of the following:

- Expand Leak Detection and Repair (LDAR) source applicability
- Reduce LDAR detection thresholds
- Require “first attempt at repairs”
- Require Directed Inspection and Maintenance (DI&M) programs
- Expand Reg. 7 LDAR area applicability from the NAA to the entire state

Reg. 7, XII.B stipulates that LDAR programs, as provided in 40 CFR Part 60, Subpart KKK (KKK), apply to all gas processing facilities within the NAA. The purpose of LDAR programs is to reduce fugitive leaks from natural gas facility components (e.g., valves, pump seals, connectors, flanges, open-ended lines, and compressor seals) by detecting leaks and repairing or replacing leaking components. Fugitive leaks are unintentional releases of liquids or gases resulting from wear of component mechanical joints, seals, and rotating surfaces. These leaks can be a large source of methane and volatile organic compounds (VOCs) emissions, and lead to economic loss, potential safety hazards, and reduced air quality.

Expand LDAR Source Applicability

The LDAR program described in KKK applies only to onshore natural gas processing plants. The Colorado Air Pollution Control Division (APCD) is considering revising Reg. 7 so that KKK will apply to additional sources within the NAA, including compressor stations and exploration and production (E&P) sites. Fugitive emission sources at compressor stations and E&P sites are similar to sources at natural gas processing plants.

Reduce LDAR Detection Threshold

KKK, Part 60.633 (2) defines a leak occurrence as when a leak detecting instrument measures VOCs at least 10,000 parts per million (ppm). The APCD is considering revising Reg. 7 by reducing the detection threshold for VOCs within the NAA to 500 ppm for valves and 2,000 ppm for pumps. These lower thresholds, which have been added to the Suncor Energy (U.S.A.) Inc. (Suncor) and Roche Pharmaceuticals permits, are based on requirements from two Federal Consent Decrees (Civil Action No. H-01-4430 and SA-05-CA-0569).

First Attempt at Repairs

“First Attempt at Repairs” is language that is based on the two Federal Consent Decrees described in the previous paragraph. It was written into the Suncor operating permit, number 96OPAD120. It states that a “first attempt at repair” will be made on any valve that is leaking VOCs at a rate that is greater than 200 ppm, excluding control valves, pumps, and components that LDAR personnel are not authorized to repair. The repair would be made no later than the next business day after the leak is detected. The leak would be monitoring again no later than 4 business days following the repair to ensure the leak is not worse. The intent is to make an effort to repair a leak promptly, and often can be as simple as tightening a connection. The APCD is considering requiring this option at all facilities within the NAA that are required to comply with KKK.

Directed Inspection and Maintenance Programs

A DI&M program begins with a baseline survey to identify and quantify leaks. Repairs are then made only to the leaking components that are cost-effective to fix, based on criteria such as repair cost, expected life of the repair, and payback period. Subsequent surveys are designed based on data from previous surveys, allowing operators to concentrate on components that are most likely to leak and are

profitable to repair. DI&M programs can be effective at most locations, including natural gas processing facilities that are regulated under KKK, due to the profit component.

Techniques for identifying fugitive leaks include soap bubble screening, Toxic Vapor Analyzers (TVAs) and Organic Vapor Analyzers (OVAs). However, these manual techniques are time consuming, inefficient, and expensive if operators must screen hundreds or thousands of components. Optical imaging is a new class of technology that uses principles of infrared light and optics to create an image of emission plumes. This may be more cost effective than older techniques as it allows an operator to scan areas containing hundreds of potential leaks quickly and remotely, avoiding the need to manually measure each potential leak. Optical imaging technologies include Backscatter Absorption Gas Imaging (BAGI), Light Detection and Ranging (LIDAR), Differential Absorption LIDAR (DIAL), and Tunable Diode Laser Absorption Spectroscopy (TDLAS). The instruments can be hand-held or shoulder-mounted (generally suited to gas processing or compressor plants), or van or aircraft mounted (generally suited to pipelines and tank batteries).

Once leaks have been identified, they need to be measured to determine which leaks will be cost-effective to repair. There are several methods to measure leak rates or volumes, including bagging, high volume samplers, and rotameters. Leaks are prioritized by comparing the value of the natural gas lost with an estimated cost in parts, labor, and equipment downtime to fix the leak, as necessary.

Expand LDAR Area Applicability

Reg. 7 requires that all natural gas-processing plants located in the NAA shall comply with the LDAR program as described in KKK, effectively removing some KKK exemptions. The APCD is considering revising Reg. 7 to expand the applicability area from the NAA to the entire state.

Air Quality/Health and Welfare Benefits

The EPA reports that natural gas processing plants and associated compressor stations emit an estimated 36 billion cubic feet (Bcf) of methane annually. More than 24 Bcf of total methane losses from gas plants are fugitive emissions from leaking compressors and other equipment components such as valves, connectors, seals, and open-ended lines.¹

While health benefits are not quantified here, it is understood that reducing direct emissions of VOCs will reduce air toxics and other criteria pollutants. This will reduce the incidence of human health impacts caused by pulmonary, cardiovascular, respiratory, and nervous system disease. Because ozone damages crops, forests, and other natural plant life, all would benefit if emissions are reduced. This strategy would also reduce emissions of methane and other greenhouse gases, which contribute to climate change.

Expand LDAR Source Applicability

To be determined.

Reduce LDAR Detection Threshold

To be determined.

First Attempt at Repairs

To be determined.

Directed Inspection and Maintenance Programs

Implementing a DI&M program is a proven way to reduce natural gas emissions by up to 96 percent, which corresponds to reducing methane emissions by 80 percent.¹

Expand LDAR Area Applicability

To be determined.

Program Costs

Expand LDAR Source Applicability

To be determined.

Expand LDAR Source Applicability

To be determined.

Expand LDAR Area Applicability

To be determined.

Reduce LDAR Detection Threshold

To be determined.

First Attempt at Repairs

The cost of implementing “first attempt at repairs”, which generally involves tightening a connection, is negligible.

Directed Inspection and Maintenance Programs

When a DI&M program is implemented correctly, companies generally save money. Natural Gas STAR partners have reported saving between \$58,000 and \$164,000 per natural gas processing facility.¹

Implementation/Administration

This strategy has the potential to significantly increase the number of regulated sources, and has reporting, permitting, and/or compliance assurance impacts to the APCD.

¹ US EPA, *Lessons Learned: Directed Inspection and Maintenance at Gas Processing Plants and Booster Stations*