

Taking Gas Imaging to the Next Level Order of Magnitude Estimation

The El Paso Pipeline Group has a history of pursuing the reduction of fugitive gas. Our involvement with gas imaging continues to show our commitment at seeking technology that will lead to identifying fugitive gas. The pipeline group saw the potential of the technology and purchased our first camera late 2005. The group now owns 4.

Industry research has shown the largest contributors to fugitive gas are vented components. These vented components are vented high above personnel, above building eaves, out of “typical” viewing, etc. Applying gas imaging and laser technology will help us to “reach out” and sense for the presence of gas in areas formerly unobtainable.

Clearly, the opportunity to “view” fugitive gas is very powerful. Now that technology allows us to see fugitive gas. The big question has evolved to: “Can we estimate the gas loss from these images?”

First, some program details.

The gas imaging camera is not a do all tool. It is one of many tools designed and available to locate and in some cases, guesstimate the magnitude of the fugitive gas loss. Depending on the source of fugitive gas that is being evaluated, there are several methods available to detect and or measure the fugitive loss (e.g., flow devices, anti-static bags, etc.).

Now that we have gas imaging, a typical fugitive gas survey scenario is described below:

- You report finding 10 “leaks” to area management.
 - Response to your discoveries are:
 - 1st -“How big were the leaks?”
 - 2nd -“How much is it going to cost to fix them?”
 - 3rd -“Do I need to shut something down?”
1. What do you tell the manager?
 2. What is the repair priority?

To address the scenario stated above, a video comparison method was developed and field tested with promising results. We continue to work to develop the technique to determine the order of magnitude of fugitive gas source.

The Comparison Method

Drivers for the Comparison Method

- We all know that a 5 cfm gas flow in a 2" pipe will look much different than a 5 cfm gas flow in a 6" pipe. How is the order of magnitude differentiated?
- Renting personnel lifts to obtain a gas flow measurement gets expensive.
- For those facilities that have personnel lifts, time is still expended setting up the lifting device to get a measurement.
- Safety is our main concern. Exposure to a high pressure release of gas through vent stacks is always a possibility.
- How do we communicate order of magnitude of the video?

The Comparison Method

This methodology will continue to be refined as additional field measurements are gathered.

1. A series of gas measurements at known flow rates were collected using a calibrated measuring device.
2. The series of known flow rates were run thru various pipe sizes.
3. Field video measurement is taken and compared to a video library of similar pipe size.
4. Order of magnitude is determined by comparing the plume size.

Factors Influencing a Video Reading

Economics –

- It is important to get an order of magnitude of the fugitive source. Depending on the component, it does not matter if the fugitive gas volume is 6 or 8 cfm. Be conservative and go with 6. If the component is a large ticket item like a large valve and based on 24 hours of pressurization time, what is the difference between an 8.6 Mcf/day or 11.5Mcf/day gas source. At \$4 gas, the value is either \$34/day or \$46/day.

It still pays back!

Environmental –

- Atmospheric conditions – 3 major atmospheric conditions that affect the quality of a video are: Wind, Clouds and Background Temperature.
 - Wind – plume dissipation will occur during high wind conditions. Higher winds will shear the plume at the end of a vent pipe making the evaluation of a plume difficult.
 - Clouds – When using the sky as a background, the optimum condition is a clear blue sky. Clouds tend to distort the image quality. The moisture in heavy clouds provides a dark background and contrasts with the gas image which is typically also dark.
 - Background Temperature – the background should be as much a contrasting temperature relative to the gas. Hot environments tend to overload the infrared camera with infrared radiation, and the gas image is undetectable.

Summary -

Gas imaging equipment is not a do all tool. Should all entities have one? It depends upon each entity's needs. It is one of many tools available to locate fugitive gas. Tools such as snoop, vent monitors, anti-static bags, gas flow indicators, etc. are available to those interested in addressing fugitive gas.

Determining what types of tools would benefit an organization depends on many factors. Factors such as: available personnel, corporate culture, regulatory drivers, capital stability, etc., etc.

The following Levels are offered to organize thoughts to assist with determining an organizations fugitive gas involvement. The level of involvement would point to the level of tools needed. Programs can be separated in 3 levels:

- Level 1 Screen and fix – This is the lowest cost level. This culture is described as a regularly scheduled routine of find and fix.
- Level 2 Screen, Quantify, and Prioritize – Involves efforts in Level 1 along with the purchase of higher cost equipment since measurement equipment is required.
- Level 3 Document and Promote Culture Change and Continue to Promote Voluntary Efforts – Involves efforts in Levels #1 and #2 and additional monetary commitment since this involves the purchase of gas imaging equipment.

Gas imaging can now “tangibly” show decision makers the order of magnitude of a fugitive gas source. Managers will no longer question whether a leak exists if they can see it! Decision makers see the problem and prioritize the repair. The video heightens awareness of individuals working around the equipment.

In a voluntary fugitive emission world, there is tremendous value in being able to show someone the efforts of their voluntary action. It is one thing to talk about it and another thing to show it. The advent of gas imaging and laser gas detection technology opens the door to change in the gas industry.

Gas Imaging is a great tool in the tool bag of fugitive gas detection and measurement.

In this case, a picture is indeed worth a thousand words.