

Dew Point-ers: Keep Your Calibration Gas Standards Effective

Here's an obvious claim: Calibration gas mixtures should contribute to accurate readings.

What's not so obvious, however, are some of the factors that can cause a calibration gas to become ineffective. And having large quantities of accurate gases on site is more crucial than ever since the new Refinery Sector Rule (RSR) has influenced more widespread usage of Btu NHV calibration standards to measure flare emissions. As refineries strive for compliance, what can they do to keep their standards well mixed and providing consistently accurate measurements?

According to Andy Shurtleff, Airgas' Market Development Manager for Refining and Petrochemicals, one area to focus on is a gas cylinder's dew point vapor pressure limit (DP-VPL). What is that and why should you care? Get the details in the following Q&A:

What is a dew point vapor pressure limit?

Dew point vapor pressure limit is basically the most extreme condition at which a gas will remain a gas. Specifically, it's the highest pressure and lowest temperature at which a gas-phase calibration cylinder can operate when filled.

What happens when DP-VPL is exceeded?

If the cylinder temperature drops below the DP-VPL or if the cylinder is filled above the pressure cap, some components can move from a gaseous to liquid state. (Like water molecules from the air condensing on the outer surface of a cold glass.)

Why is this a concern for calibration gas mixtures?

Since not all components have the same pressure and temperature limits, potential liquefying raises serious concerns for plants that use gas-phase calibration standards. As some components "fall out of solution" and others stay in their gaseous state, the mixture separates or stratifies. And withdrawing gas from a cylinder while it is separated will result in:

- Inaccurate/inconsistent analysis
- Incorrect measurement and reporting
- Permanent damage to the calibration gas mixture

What kind of inconsistencies will occur?

Your analyzer will read the concentration range of gaseous components as artificially high and liquefied components as artificially low—compared to the original blend mixture. Once the cylinder warms back up for a sufficient time, the gaseous components that read high will now be proportionately lower and those that were liquefied during use will now be higher than in the original gas mixture.

What can you do to avoid this issue?

When you work with gas-phase calibration standards—particularly, ones with DP-VPLs—do everything you can to keep all gaseous components in a fully gaseous state. A good start? Proper storage. To keep all components in their gas state and well mixed, store dew point vapor pressure limited gas cylinders in a room with the following temperature conditions:

- 30°F higher than the engineering dew point stated on the cylinder's Certificate of Analysis
- Less than 125°F (52°C)

This is best accomplished by keeping cylinders in a heated enclosure. You can also use a specifically designed cylinder heating jacket constructed of materials approved by Underwriter's Laboratories Inc. Besides temperature, other things to consider in a storage space include:

- Electrical wiring
- Gas detection
- Regulatory code factors

Code factors can include considerations such as the maximum quantity of cylinders allowed in a given area, flammability, toxicity and proximity to oxidizers.

Can compromised standards still be used?

If you suspect that your gas mixtures have dropped below their rated dew point, restore them to a full gaseous state prior to use. You can accomplish this gradually by returning them to the proper storage environment mentioned above (30°F higher than their rated dew point, but under 125°F) for 72 hours. This will allow all components to return to the gas state and remix.

You can also free components from cylinder side walls by agitating the cylinders with a specifically designed gas roller. But remember: It's a lot easier to keep your cylinders in spec than to recover after a problem has occurred.

Important safety note: Do not use any method (heat guns, fired heaters, steam, heat coils, etc.) to apply direct heat to the cylinder to expedite the reheating process (because it can weaken the cylinder and result in catastrophic failure).

Conclusion

DP-VPLs are yet another factor for refineries, pipelines and other sites to consider when looking to maintain reliable and compliant operations. If possible, use blends that are engineered to supply the most gas possible with minimum special care or maintenance. Not available? Safe use and storage, as described above, will do the job.

Concerned about what new regulations mean for your plant? Read these other helpful articles from Andy Shurtleff:

- [Refinery Sector Rule \(RSR\) Update: NHV Management](#)
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- [Refinery Sector Rule \(RSR\) Update, Part 2: Monitoring Flare NHV](#)
 - [Face Up to the Challenge: New EPA Refinery Flare Requirements](#)
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