



Application Note GasMix 16-02

Multipoint calibration of an elemental analyzer from a LPG standard

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This application note describes the calibration of a sulfur and nitrogen analyzer PAC-Antek, model Multitek NS with a GasMix™ AIOLOS option LPG.

What is a LPG?

A Liquefied Petroleum Gas (LPG) is a mixture of light hydrocarbon gases and is prepared by refining petroleum or "wet" natural gas. It is almost entirely derived from fossil fuel sources, being manufactured during the refining of petroleum (crude oil), or extracted from petroleum or natural gas streams as they emerge from the ground. These gases are mostly propane, or butane or a mix of both.

LPG will evaporate quickly at normal temperature and pressure and is usually supplied in pressurized steel vessels, which is convenient for transportation and commercialization.

Liquefied Petroleum Gas is a new environmental challenge, because this new fuel has the advantages to reduce the emissions of nitrogen oxides, carbon monoxide, hydrocarbon gases and particles in comparison to regular fuels. More and more, it is used as a propellant and a refrigerant (instead of CFCs).

However, since it is being used as a fuel, it is mandatory to monitor sulfur and nitrogen composition.

Technical description

A LPG standard containing a sulfur compound (di-methyl sulfur) and a nitrogen compound (acetonitrile) at a concentration of 100 ppm mol/mol is used for the calibration. Argon is used as diluting gas.

The analyzer to be calibrated is a Multitek from PAC-Antek, which can measure total sulfur according to ASTM method D6667 and total nitrogen in different matrices (gas, liquid, and solid) by UV-fluorescence and chemiluminescence (resp.). The gas mixing device GasMix™ AIOLOS, for aggressive gases, is equipped with a vaporizer and an injection valve with a sample loop of 10ml.

A sequence is set with four different concentrations plus a blank, three replicates per concentration: 100, 75, 50, and 25 ppm (for both sulfur and nitrogen).

Each gas mixture is sent to the analyzer during 1'30" in order to purge all gas lines and minimize adsorption phenomena. The automatized GasMix™ sequence is launched by the Multitek, then, during the sequence, GasMix rotates the injection valve and shuts off the gases afterwards. When a cycle is over, GasMix waits until it receives the start signal from the Multitek.

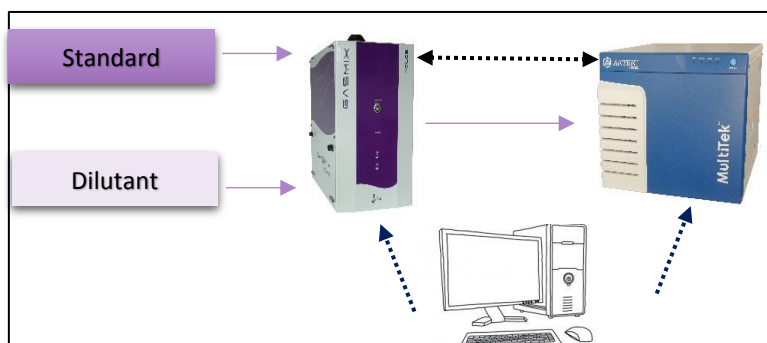


Figure 1 – Set up schematics

Automatic sequence timeline

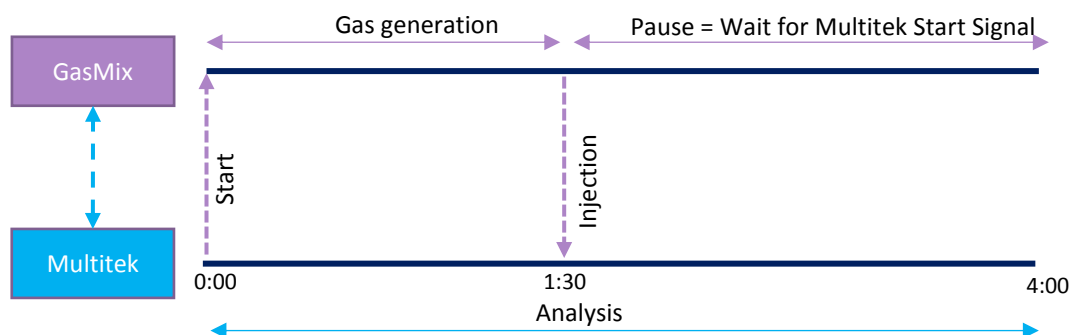
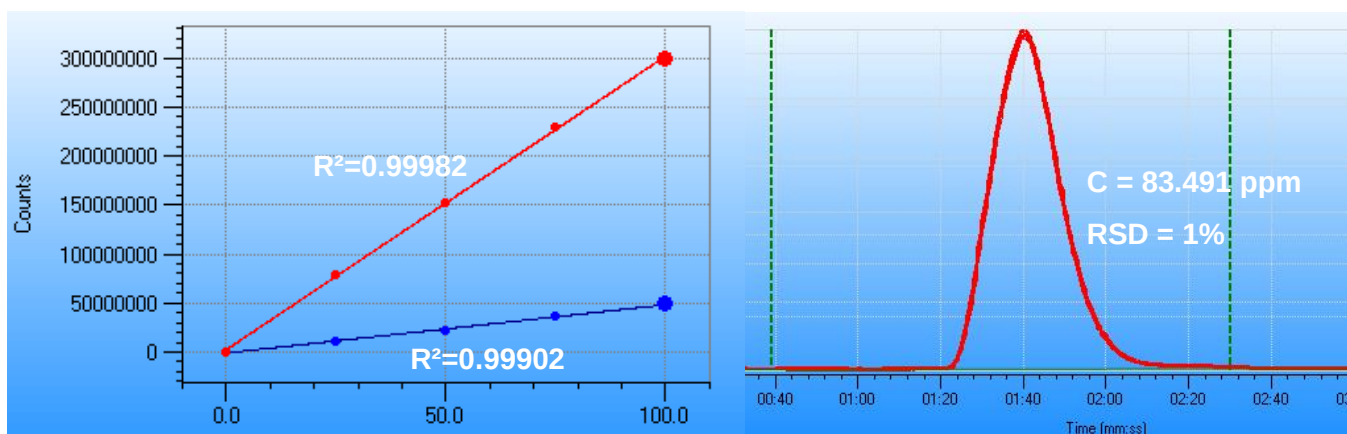


Figure 2 – Timeline of an analysis

Results



Figures 3 and 4 – Calibration with a LPG standard (response versus concentration) and Injection of a LPG control

A control standard, whose certificate indicates a sulfur concentration of 78 ± 7 ppm, is analyzed with the same method, and gives a result of 83,491 ppm.

Conclusion

The use of a gas mixing system with the LPG option allowed to check the linearity of the analyzer. Using a LPG standard avoids matrix effects (that can occur if an analyzer is calibrated with gases while samples being LPG), giving more accurate results.

Moreover, buying 4 or 5 LPG standards is a long and expensive procedure. GasMix option LPG will be able to prepare low level standards, without limitations in the number of points, with only one LPG standard, saving time and money.