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GasMix Application Note 05

COMPUTER-CONTROLLED GAS DILUTION

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Calibrate at different concentrations from only one gas cylinder, through automated sequences and without operator attendance.

Most of gas analyzers are calibrated with a single gas cylinder. These certified gases are considered as primary standards, but they are expensive, difficult to stock and unstable over the time.
GasMix offers the possibility to optimize the use of these standards, and to control consumption of gases.

Diluting a gas

Gas dilution methods used in analytical laboratories are most of the time semi-quantitative, like the ones using syringes or vacuumed bombs.

However, exponential dilution or flow measuring methods are acknowledged to be accurate. GasMix is compliant to ISO 6145-7. The instrument allows creating in situ gas standards at a precise concentration, thanks to 2 (up to 4) Mass Flow Controllers (MFC).
On MFC 1 is a standard at a well-known flow. On MFC 2 is an inert gas (for example a GC carrier gas) or a pure gaseous matrix at a well-known flow. By knowing both flow values and the initial concentration of the gas standard, different concentrations can be achieved and directly sent to the analyzer.

For instable or very polar molecules, such as H_2S or NO_x, molecules which, at low concentration, can easily be absorbed on gas cylinder walls, it is highly recommended to start from a high concentration standard, and to dilute it in situ and live thanks to a GasMix just before injecting it.

Operating conditions

Given C1 the initial concentration of the gas standard, in ppm mol/mol,
Given F1 the flow of the initial gas standard on MFC 1 in mL/min, and
Given F2 the flow rate of the diluting gas on MFC 2 in mL/min,
Then the created concentration C'1 would be :

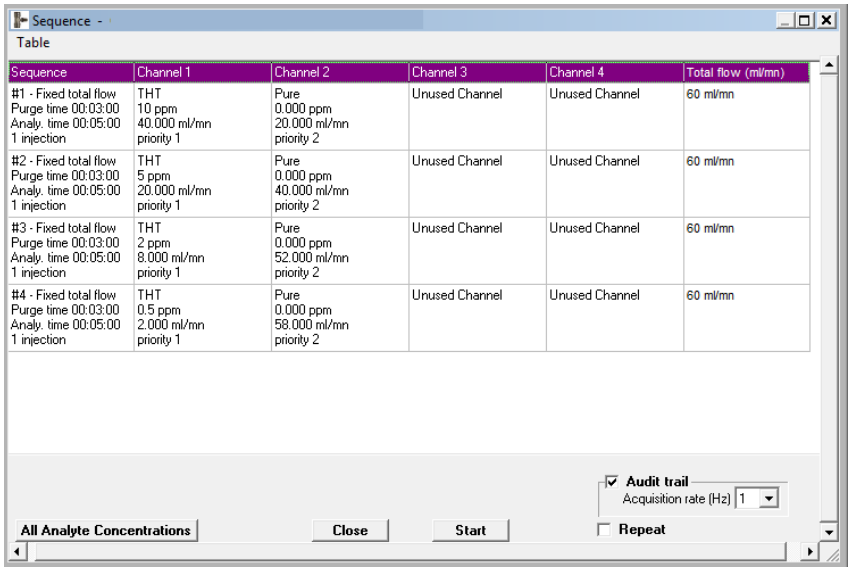
$$C'1 = \frac{C1 \times F1}{(F1 + F2)}$$

Each Mass Flow Controller is calibrated by AlyTech, specifically on the gas of interest, in order to have more precise flow rate, hence a more precise concentration.

Here is the flow principle of GasMix (software screenshot):

In one cylinder is a standard with 15ppm mol/mol THT, in the other helium. These two gases are mixed and injected into the sample loop of the analyzer.

By indicating the total flow rate and the concentration one wants to achieve, the software automatically calculates the flow to be applied to the MFC.



GasMix™ being completely automatic, a multipoint calibration can be totally unattended. This allows a major human workload reduction for the laboratory manager. Preparing one gas injection or just a complete automatic sequence does not take any extra operator time.

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