Politecnico di Bari

- SENSOR CALIBRATION
- LASER-BASED SPECTROSCOPY
- OPTICAL TECHNIQUES

A SOLID BUSINESS CASE IN COLLABORATION WITH
THE "POLITECNICO DI BARI"

GENERAL INFORMATION ABOUT THE PROJECT

TARGET OF THE PROJECT:
Analysis of Complex Gas Matrices for Research Applications

DEPARTMENT:
PolySenSe Lab

HEAD OF PROJECT MANAGEMENT:
Vincenzo Spagnolo

ROLE OF MCQ INSTRUMENTS:
To generate complex Gas Samples with a dilution precision compatible to the concentration accuracy level required

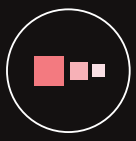
MORE INFORMATION ABOUT THE HEAD OF THE PROJECT

Vincenzo Spagnolo received the degree (summa cum laude) and the PhD, both in physics, from University of Bari. He works as Full Professor of Applied Physics at the Technical University of Bari.
Since 2017, he is the director of the joint-research lab PolySense, created by THORLABS GmbH and Technical University of Bari, devoted to the development and implementation of novel gas sensing techniques and the realization of highly sensitive QEPAS trace-gas sensors.

DESCRIPTION OF THE APPLICATION AND THE TARGET

The analysis of complex gas matrices represents a key research activity to investigate the fundamental absorption - relaxation properties in laser-based gas spectroscopy and develop solid regression approaches for the evaluation of unknown samples.
Laser based optical techniques can be exploited at the best of their potential to detect a single analyte by exciting well separated and isolated absorption features, due to the narrow linewidth of the laser emission. When a gas sample is composed of multiple molecules, the overlap of the absorption features strongly affects the analysis. Therefore, it is crucial to develop regression methods able to retrieve the concentration of each component with high accuracy and precision. In order to address this issue, a proper sensor calibration must be carried out by generating a large number of samples characterized by different concentrations of the gas species expected. Starting from this set of samples, the sensor can be trained, tested and validated. For the photoacoustic techniques in particular, beside the spectroscopic complexity of the absorptions, the effect of the gas matrix variation on the signal processing must be also evaluated. In fact, the variation of the gas matrix affects the radiation-to-sound conversion efficiency.

All these circumstances make the use of a reliable Gas Mixer mandatory. In this context, the Gas Blender allows the user to dedicate different channels to different gas species and generate complex gas samples with a dilution precision compatible to the concentration accuracy level required by these investigations focused on the physics of absorption.



GAS MIXER VS GAS CYLINDER:

The ability to blend natural gas simulations on-demand is an incredibly powerful tool in the development of innovative gas detection equipment. And provides a level of flexibility that gas cylinders cannot provide.

FLEXIBILITY:

By using the MCQ gas blender it is possible to dial up a simulation of a natural gas mixture at any time, and to a certain degree, different concentrations of the blended natural gas mixture.

COSTS and SPACE SAVINGS:

Buying cylinders of natural gas blends is expensive and limits the availability of mixtures that may be required. Gas cylinders are also large and often require special storage arrangements, as well as taking up valuable space.

PHYSICS OF ABSORPTION:

Gas Blender allows the user to generate complex gas samples with a dilution precision compatible to the concentration accuracy level required by these investigations focused on the physics of absorption.

SUCCESSFUL ACHIEVEMENT:

The MCQ gas blender is used to simulate approximations of natural gas mixtures allowing on-demand, real time characterisation of sensors.

FLOW STABILITY:

Thanks to our revolutionary method every gas flow has a great stability making possible to have a stable flow also for lower flow-range.

READY TO TALK ABOUT YOUR SOLUTION?

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