SOTACARBO
SUSTAINABLE ENERGY
RESEARCH CENTRE

CALIBRATION OF (GC)
GAS CHROMATOGRAPH

A SOLID BUSINESS CASE IN COLLABORATION WITH
SOTACARBO S.p.a.

GENERAL INFORMATION ABOUT THE PROJECT

TARGET OF THE PROJECT:
Methanol and DME production from CO_2: catalyst synthesis, characterization and performance

DEPARTMENT:
Process Analysis and CCU

HEAD OF PROJECT MANAGEMENT:
Mauro Mureddu

ROLE OF MCQ INSTRUMENTS:
Mixing a pure gas cylinder of DME, with an inert gas (N_2) for calibrating the GC instruments.

MORE INFORMATION ABOUT THE HEAD OF THE PROJECT

Dr. Mauro Mureddu was born in Carbonia, Italy, in 1983; he is graduated in Materials Science and Ph.D in Chemistry. Dr. Mureddu is currently senior scientist in the Sotacarbo's Process Development Team. His research activity is mainly focused on carbon capture storage and utilization, coal/biomass/CO_2 to liquids, syngas cleaning, catalysts and materials characterization.

DESCRIPTION OF THE APPLICATION AND THE TARGET

Increasing attention toward climate changes and the recent strategic policies to stabilize and reduce the amount of CO_2 emissions have resulted in the promotion of research in the field of carbon capture, utilization and storage, where CO_2 utilization technologies are expected to play a very important role. The aim of the activity is the development of advanced catalysts, both supported and non-supported for the production of methanol and dimethyl ether (DME) from CO_2. Thanks to the encouraging results, the obtained catalysts are the subject of the PCT (Patent Cooperation Treaty) application number PCT/EP2019/053068: "Efficient catalyst for the conversion of CO_2 to methanol". Their catalytic activity is determined in a high pressure automatic bench-scale reactor under realistic conditions (250°C, 30 bar, gas feed: 75% H_2/25% CO_2, by volume). The concentrations of the inlet gas and the reactor effluent are monitored by means of an online gas chromatograph (Agilent 7890B) equipped with TCD detector for H_2, N_2, CO_2, CO and ther possible hydrocarbons (CH_4, C_3H_8, C_4H_{10} etc.) and a FID detector for H_2S, CO_2, CH_3OH, DME, C4/C5.

BENEFITS AND SAVINGS

The use of the MCQ 4000 series allows to obtain a double advantage: (i) the desired concentration of different gas mixtures for the achievement of reliable calibration curves using only pure gases; (ii) the possibility to feed, at low pressure, the bench-scale plant with different gas compositions and different concentrations, including a simulating syngas.
A traditional calibration method would require as many gas cylinders, at different concentrations, as the number of points in the calibration curve. Furthermore, dimethyl ether (DME) is hard to be obtained in different concentrations, and it is often mixed with other impurities and it is unstable. Besides, a lot of time is required in gas delivering. In this regards, with MCQ instruments, Sotacarbo needs only of a pure gas cylinder of DME, mixed with an inert gas (N_2) for calibrating the GC instruments. This solution has been successfully employed for calibrating other gases such as H_2, CO_2, CO, CH_4 or N_2 with a remarkable saving of money and reducing time.

GAS MIXER VS MASS FLOW:

GB4000 Series and its software made the calibration an easy procedure comparing it with the traditional mass flow controllers system.

TIME SAVINGS:

Without the MCQ Gas Blender, for each point of the calibration curve, the replacement of the gas cylinder is necessary. With the MCQ solution you can quickly calibrate the instrument for several types of gases without any replacement

FLOW RATES: NO CUT-OFF

MCQ GB4000 Series allows you to control the flow in all the calibration range, from 1 ml/min to 5000 ml/min with NO cut-off

WITHOUT MCQ? (HARD)

A standard calibration method using gas cylinders containing a mixture of gases at the desired concentration would have been used for the GC setting. The use of standard Mass Flow Controller in order to feed the bench scale plant is required to create the desired mixture.

SOFTWARE AUTOMATION:

Thanks to our Software PRO version and its option "Automatic Program", now Sotacarbo can bring forward experiments in automation, painlessly.

FLOW STABILITY:

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

READY TO TALK ABOUT YOUR SOLUTION?

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