LD17-04



Trace impurities in Carbon Dioxide for beverage and food packaging industry



With regards to the beverage industry, the dissolved Carbon Dioxide which is used as carbonic acid gives a pleasantly acidic flavour and a nice mouth-feel when drinking. When it is not present, the drinks taste flat. Being used in many different fields of food and beverage, the CO2 quality management is essential to meet the market requirements.

The CO2 is produced from different techniques such as fermentation, combustion, ammonia/hydrogen production and others. It is required by the industry, especially for bottlers to control the supply chain by monitoring the CO2 purity allowing maintenance of the product quality.

LDETEK SOLUTION:

Following the application note LD16-12 this application note shows another configuration of the MultiDetek2 with PlasmaDetek2 also related to the beverage industry where the analysis of different components in carbon dioxide is realized.

This configuration has 3 channels to cover the analysis of benzene, hydrogen sulfide, nitrogen and oxygen. Additional channels can be added if analysis of more components is required. All the components are measured with one type detector PED using Helium as carrier gas.

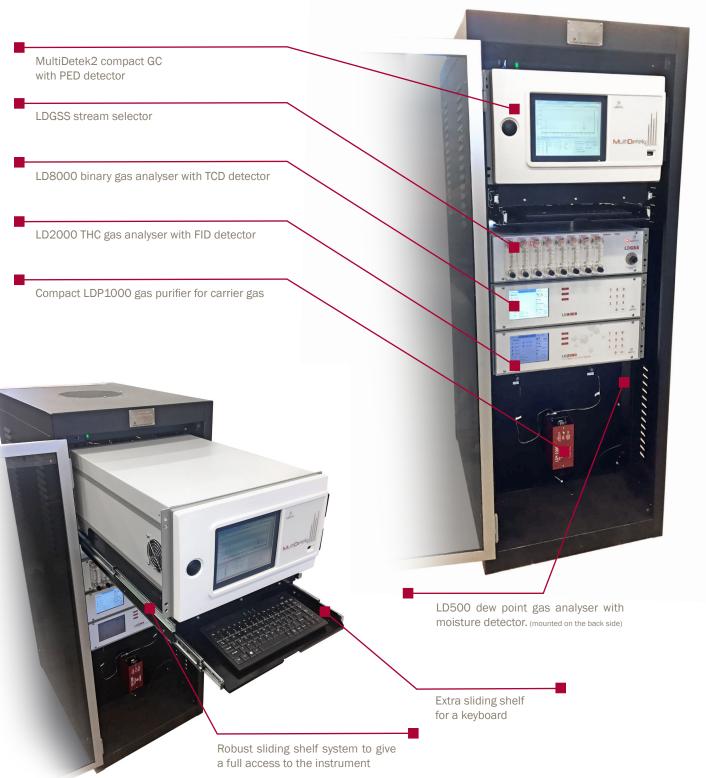
► Channel#1: 0-1000ppb benzene

► Channel#2: 0-1000ppb hydrogen sulfide ► Channel#3: 0-10ppm oxygen and nitrogen

A FID analyser LD2000 is added to this solution for measuring THC on a scale of 0-10ppm A TCD binary gas analyser LD8000 is added for measuring 98-100% CO2 purity A dewpoint meter LD500 is added for the analysis of moisture on a 0-10ppm scale

LDRACK CABINET:

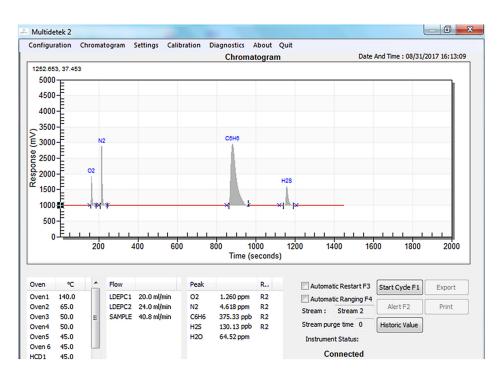
All the instruments are integrated in the LDrack cabinet. A multiple streams selector system LDGSS selects the right gas lines for analysis. The stream selector can be controlled locally or remotely with the MultiDetek2 interface. The complete solution is configured with coated stainless steel tubing to ensure stability of the system. It reduces the risk of surface absorption, especially for the sulfur components.



RESULTS:

The results show the performances of the MultiDetek2 system for a standard configuration used to measure oxygen, nitrogen, benzene and hydrogen sulfide in Carbon Dioxide. The Idl and repeatability results are demonstrated.

Analysis of a gas mixture containing a certified concentration of trace O2-N2-C6H6-H2S-H2O in balance gas CO2



LDL:

COMPONENT	CONCENTRATION	PEAK HEIGHT	NOISE	LDL (3X NOISE)
Oxygen	1.260 ppm	987 mV	4.2 mV	16.0 ppb
Nitrogen	4.618 ppm	1961 mV	2.9 mV	20.4 ppb
Benzene	375.33 ppb	1987 mV	12.6 mV	7.14 ppb
Hydrogen sulfide	130.13 ppb	611 mV	12.9 mV	8.24 ppb

Note: other LDL could be obtained with different injection volume and chromatographic condition

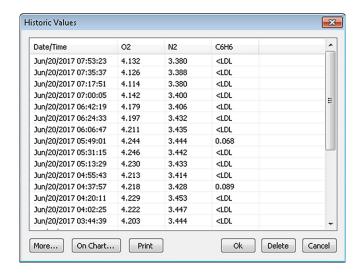
REPEATABILITY:

The results below show the repeatability for each component. Three times of the percentage of coefficient of variation (3*CV %) for each component must be smaller than 5% to meet the requirements.

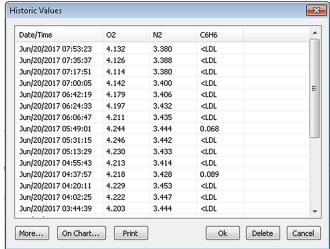
$$s = \sqrt{\frac{1}{N-1} \sum_{i=1}^{N} (x_i - \overline{x})^2}$$

COMPONENT	CV (%)	CV% x 3 < 5%
Oxygen	0.95	2.85
Nitrogen	0.66	1.98
Benzene	1.02	3.06
Hydrogen sulfide	0.74	2.22

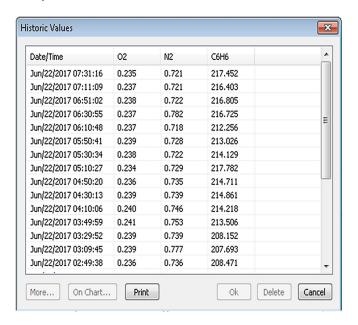
Component: 02



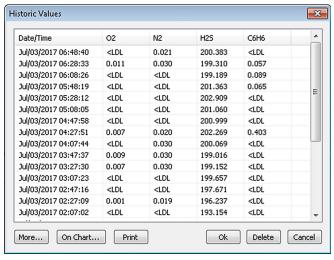
Component: N2



Component: C6H6



Component: H2S



CONCLUSION:

Our solution combining multiple LDetek instruments to achieve the complete carbon dioxide analysis all in one cabinet well demonstrated the capabilities to meet the food and beverage industry requirements. Have a look at our complementary application note LD16-012 that demonstrates other capabilities and results related to this market.

