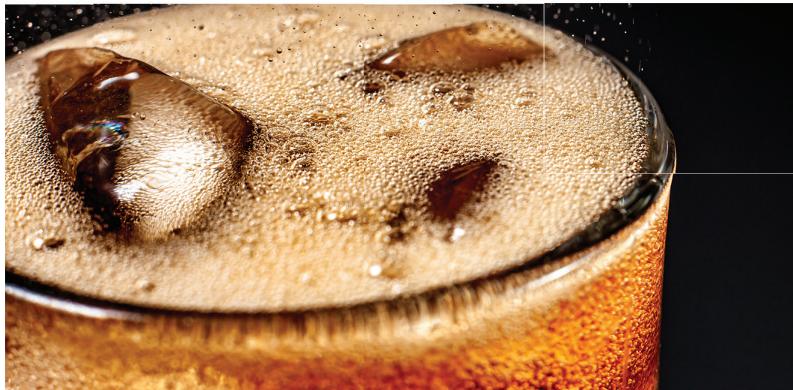




LDetek
a DwyerOmega brand

APPLICATION NOTE LD25-03

Analysis of trace impurities in UHP Carbon Dioxide



▲ Carbo2Detek



Our Carbo2Detek system has been configured here for a European customer involves in the production of carbon dioxide used for the beverage carbonisation industry. The system is configured in regulation with the standard European industrial gases association (EIGA).

LDETEK SOLUTION:

The purity CO₂ quality control solution proposed here with the MultiDetek3 gas chromatograph is for the analysis of trace impurities THCs/VOCs-H₂O-02-CH₄-CO-H₂S-COS-SO₂-CH₃CHO (acetaldehyde)-CH₃OH (methanol)-C₆H₆(benzene)-NH₃(ammonia) and NO_x. The PED with Helium carrier gas has been configured for the ppb/ppm trace analysis of oxygen, methane, carbon monoxide, sulfurs, acetaldehyde, methanol, benzene and ammonia.

An additional channel configured with an FID is used for the analysis of THCs/VOCs. Another channel configured with a quartz crystal detector allows the analysis of trace water.

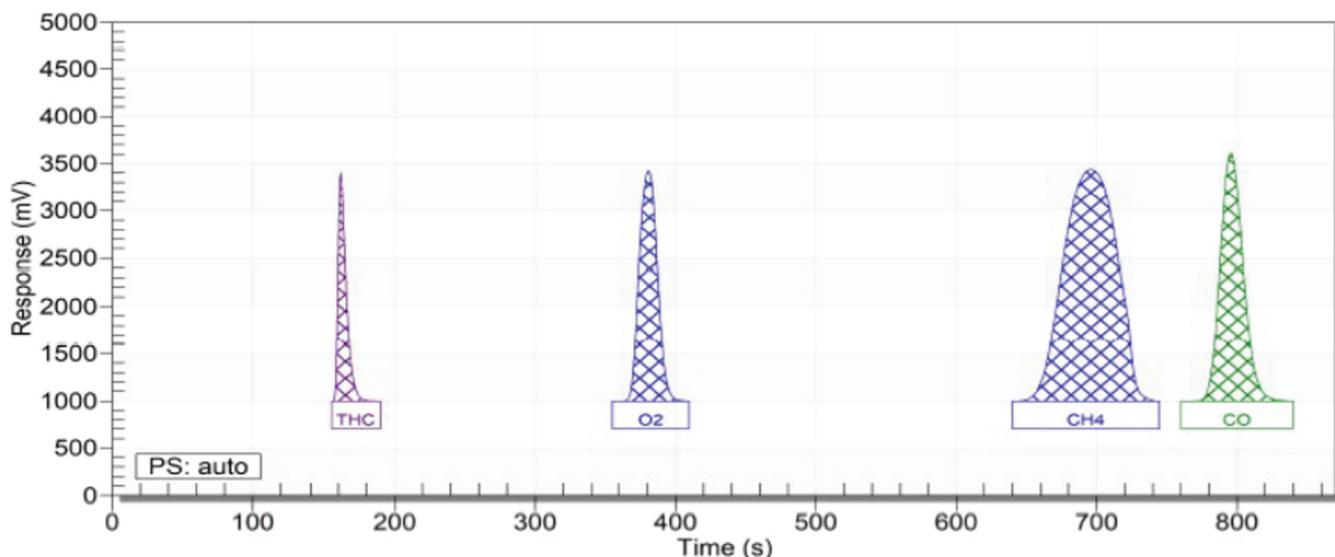
And finally, a separate third-party analyser using chemiluminescence has been integrated for the analysis of NO_x.

| COMPONENTS | RANGE (PPM) | LDL (PPB) | INSTRUMENT | TECHNOLOGY |
|------------|-------------|-----------|-------------|----------------------------|
| THC | 0-100 | 100 | MultiDetek3 | Flame ionization detector |
| O2 | 0-100 | 100 | MultiDetek3 | Plasma emission detector |
| CH4 | 0-100 | 100 | MultiDetek3 | Plasma emission detector |
| CO | 0-100 | 100 | MultiDetek3 | Plasma emission detector |
| H2O | 0-100 | 100 | MultiDetek3 | Quartz crystal detector |
| H2S | 0-10 | 10 | MultiDetek3 | Plasma emission detector |
| COS | 0-10 | 10 | MultiDetek3 | Plasma emission detector |
| SO2 | 0-10 | 50 | MultiDetek3 | Plasma emission detector |
| CH3CHO | 0-10 | 50 | MultiDetek3 | Plasma emission detector |
| CH3OH | 0-100 | 100 | MultiDetek3 | Plasma emission detector |
| C6H6 | 0-100 | 100 | MultiDetek3 | Plasma emission detector |
| NH3 | 0-10 | 100 | MultiDetek3 | Plasma emission detector |
| NOX | 0-100 | 100 | Third party | Chemiluminescence detector |

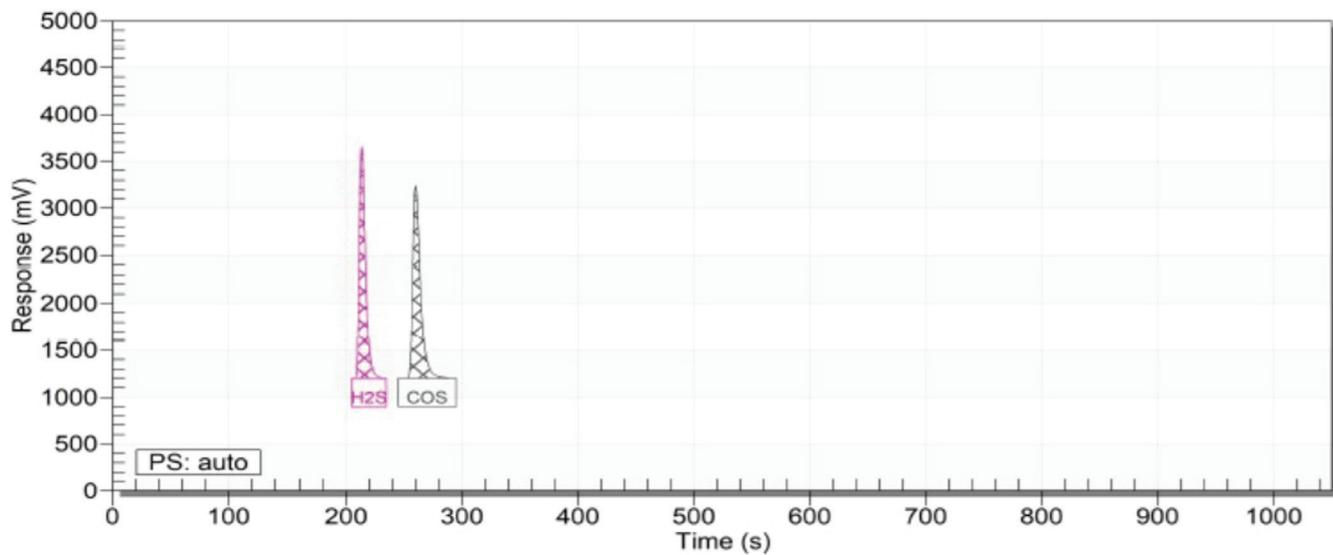
Note: Other configurations with more/less impurities to measure and different ranges/ldl are possible on request.

RESULTS:

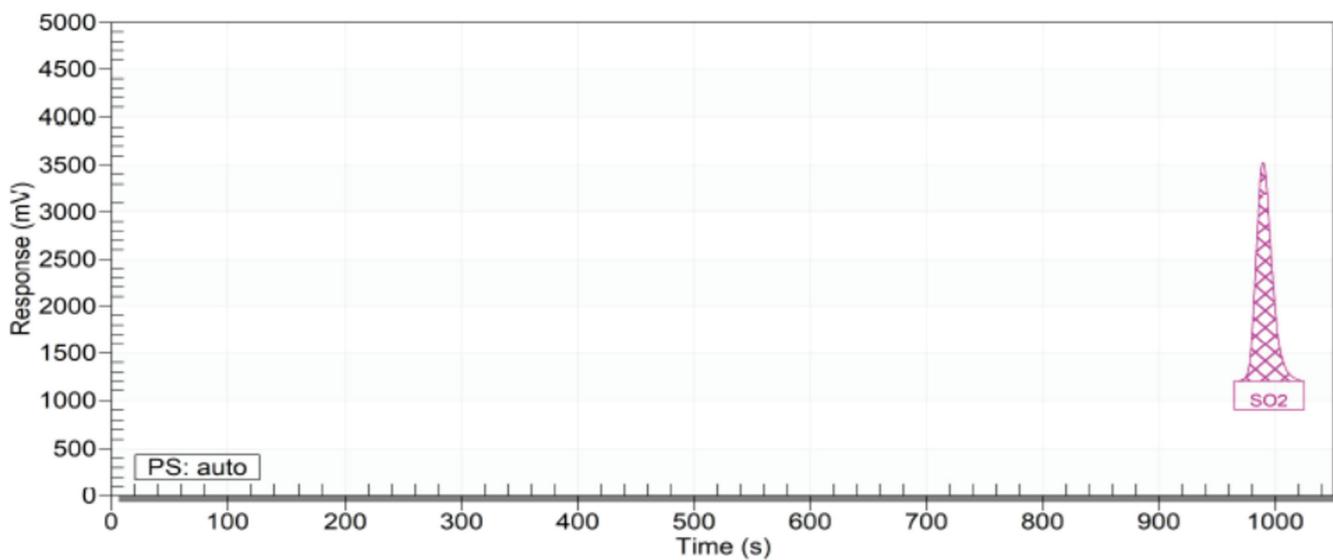
See the typical chromatograms (Span calibration) of trace impurities THC-O2-CH4-CO-H2S-COS-SO2-CH3CHO-CH3OH-C6H6-NH3 in balance gas CO2. Each of the chromatogram has been performed in a balance gas carbon dioxide.



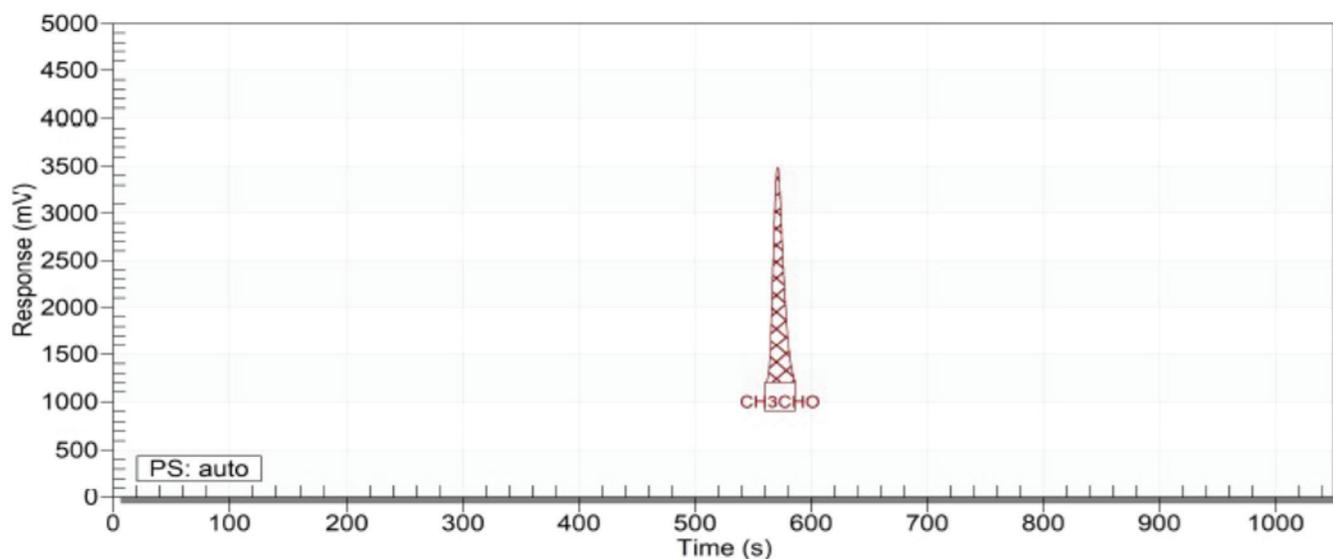
| Peak | Unit | Calibration Value | Area Counts |
|------|------|-------------------|-------------|
| THC | ppm | 96.82 | 12940 |
| O2 | ppm | 96.82 | 18862 |
| CH4 | ppm | 96.82 | 42903 |
| CO | ppm | 104.34 | 60668 |



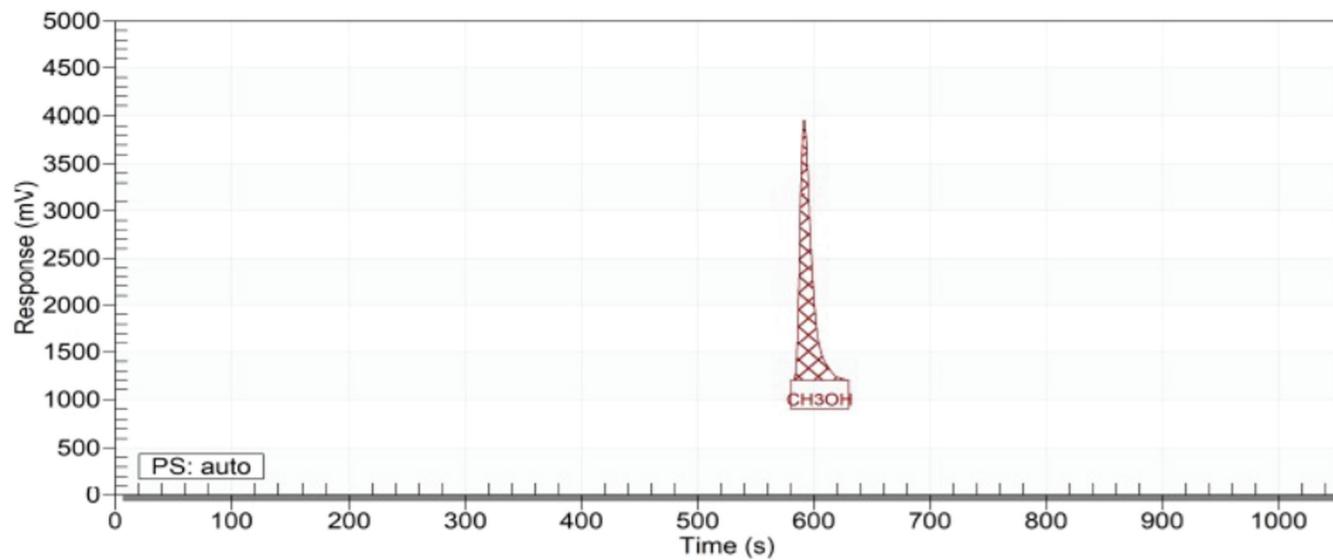
| Peak | Unit | Calibration Value | _Area Counts |
|------|------|-------------------|--------------|
| H2S | ppm | 10.72 | 8840 |
| COS | ppm | 8.90 | 9213 |



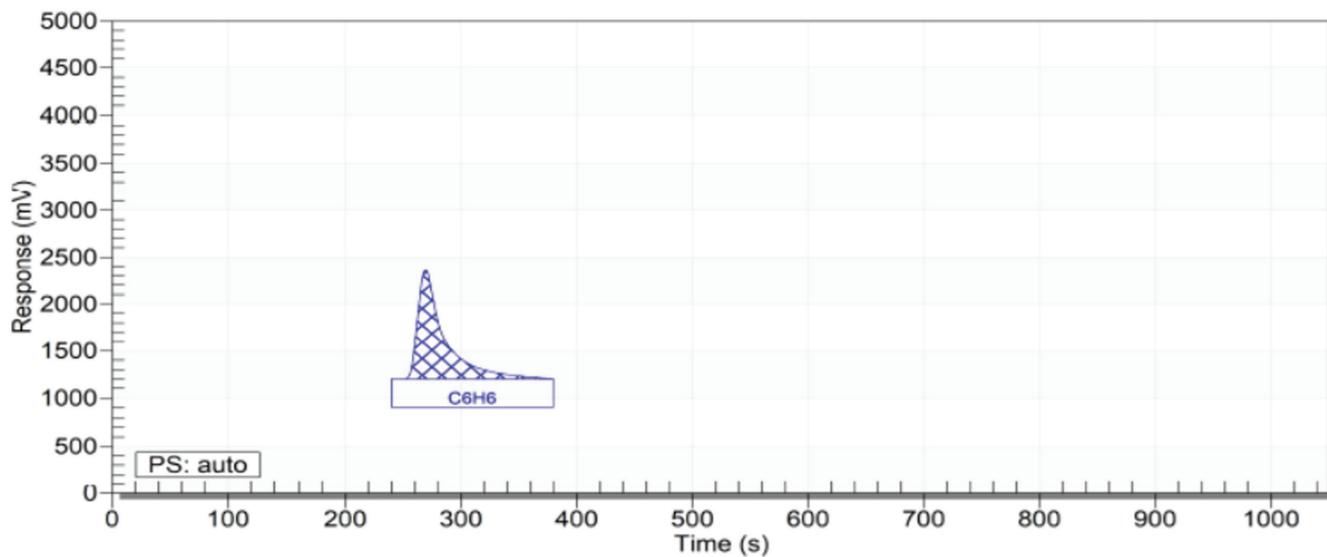
| Peak | Unit | Calibration Value | _Area Counts |
|------|------|-------------------|--------------|
| SO2 | ppm | 10.00 | 2068 |



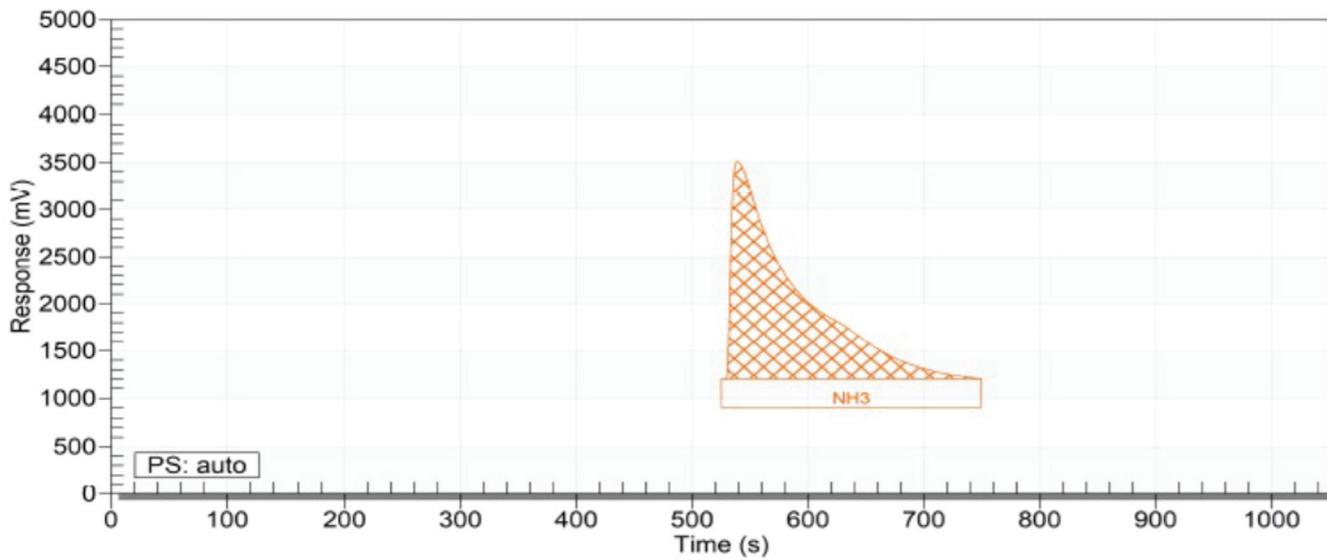
| Peak | Unit | Calibration Value | Area Counts |
|---------------------|------|-------------------|-------------|
| CH ₃ CHO | ppm | 10.00 | 7206 |



| Peak | Unit | Calibration Value | Area Counts |
|--------------------|------|-------------------|-------------|
| CH ₃ OH | ppm | 100.00 | 45406 |



| Peak | Unit | Calibration Value | _Area Counts |
|------|------|-------------------|--------------|
| C6H6 | ppm | 99.30 | 19063 |



| Peak | Unit | Calibration Value | _Area Counts |
|------|------|-------------------|--------------|
| NH3 | ppm | 10.00 | 295405 |

CONCLUSION

Our Carbo2Detek turnkey solution including the MultiDetek3 gas chromatograph configured with four technologies PED, FID, quartz crystal and chemiluminescence makes it ideal to be aligned with the standard European industrial gases association (EIGA). The Carbo2Detek is configured with all standard industrial communication protocols and a remote-control interface. The platform is modular to adapt any of additional requirement in terms of purity CO2 production. The system fills all the quality and safety requirements of the gas production industry.