APPLICATION NOTE
LD17-01

Trace Hydrocarbons and Permanent gases in Propylene

The high purity Propylene is used for the production of Polypropylene in Petrochemical industry. The analysis of trace impurities is critical to ensure a good quality of the final product. The analysis of hydrocarbons and permanent gases are required at a level below 10ppm to ensure the good operation of the production process.

LDETEK SOLUTION:

Using the PlasmaDetek2(PED) plasma detector and the MultiDetek2 compact gas chromatograph, the analysis of the most critical trace impurities in Propylene can be achieved in one unit with a single detection technology (PED).

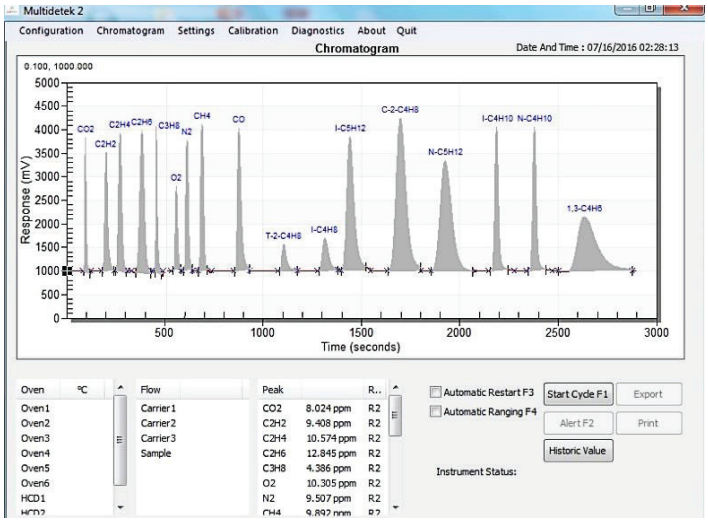
The main advantage of our solution is to use the same PlasmaDetek2 (PED) detector to measure trace impurities hydrocarbons and permanent gases in the same system. Usually, the alternative solutions have to combine more than one detector to be able to cover this application. Typically, FID and PDHID have to be combined, resulting of multi gas feeding for the different detectors. Our solution requires only one PED detector with only carrier gas to feed the system.

Our configuration has 4 channels having each an independent oven/column. The four channels all merge in the same PlasmaDetek2 detector. The detector is optimized with a combination of selective optic circuits especially for each impurity. This allows a good sensitivity and selectivity over the propylene background gas.

- **Channel#1:** Trace O2, N2, CH4, CO
- **Channel#2:** Trace CO2, C2H2, C2H4, C2H6, C3H8
- **Channel#3:** Trace i-C4H10, n-C4H10
- **Channel#4:** Trace t-2-C4H8, i-C4H8, i-C5H12, C-2-C4H8, n-C5H12, 1.3-C4H6

RESULTS

The chromatogram below shows an example of a typical calibration containing trace impurities in a balance gas of pure propylene. The concentrations of each impurities along with the response and detection limit are listed in the LDL chart below.



COMPONENT	CONCENTRATION	PEAK HEIGHT	NOISE	LDL (3X NOISE)
CO_2	8.024 ppm	2820 mV	2.2 mV	18.8 ppb
C_2H_2	9.408 ppm	2556 mV	2.2 mV	24.2 ppb
C_2H_4	10.574 ppm	2899 mV	2.2 mV	24.0 ppb
C_2H_6	12.845 ppm	3009 mV	2.2 mV	28.2 ppb
C_3H_8	4.386 ppm	3086 mV	2.9 mV	12.3 ppb
O_2	10.305 ppm	1770 mV	0.9 mV	15.7 ppb
N_2	9.507 ppm	2758 mV	1.1 mV	11.4 ppb
CH_4	9.892 ppm	3176 mV	2.2 mV	20.5 ppb
CO	9.122 ppm	3096 mV	2.8 mV	24.7 ppb
T-2-C_4H_8	2.165 ppm	578 mV	2.2 mV	24.7 ppb
I-C_4H_8	2.311 ppm	764 mV	2.2 mV	19.9 ppb
I-C_5H_{12}	8.887 ppm	2865 mV	2.2 mV	20.5 ppb
C-2-C_4H_8	9.102 ppm	3643 mV	2.2 mV	16.5 ppb
N-C_5H_{12}	7.994 ppm	2424 mV	2.2 mV	21.8 ppb
I-C_4H_{10}	9.111 ppm	3110 mV	2.2 mV	19.3 ppb
N-C_4H_{10}	9.291 ppm	3121 mV	2.2 mV	19.6 ppb
1,3C_4H_6	4.100 ppm	1256 mV	2.2 mV	21.5 ppb

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

CONCLUSION:

Our solution combining a PlasmaDetek2 (PED) with a compact GC MultiDetek2 is simple and robust for this type of application required by the market. Our solution also includes the standard industrial communication protocols to control the unit.

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