

APPLICATION NOTE

LD25-02

PST
PROCESS SENSING
TECHNOLOGIES

LDetek
A PST BRAND

MultiDetek3 fast gas chromatography with dual train feature



The trace gas analysis always requires all the analytical equipment to be sensitive to get the lowest detection limit as long as the best repeatability, the best accuracy and stability. On top of that, the market more and more requests the analysis time to be quicker. Being aligned with the demand, LDetek has develop its dual train configuration in the well known MultiDetek3 platform. This configuration allows to accelerate the analysis of the most critical impurities. There is no unique way to use this dual train feature, the goal is to identify the impurities that require more attention and a more frequent updated reading and LDetek will configure the MultiDetek3 accordingly. In this application note, we will give you 2 models of solution to demonstrate what type of benefits can offer the double train.

SOLUTION #1

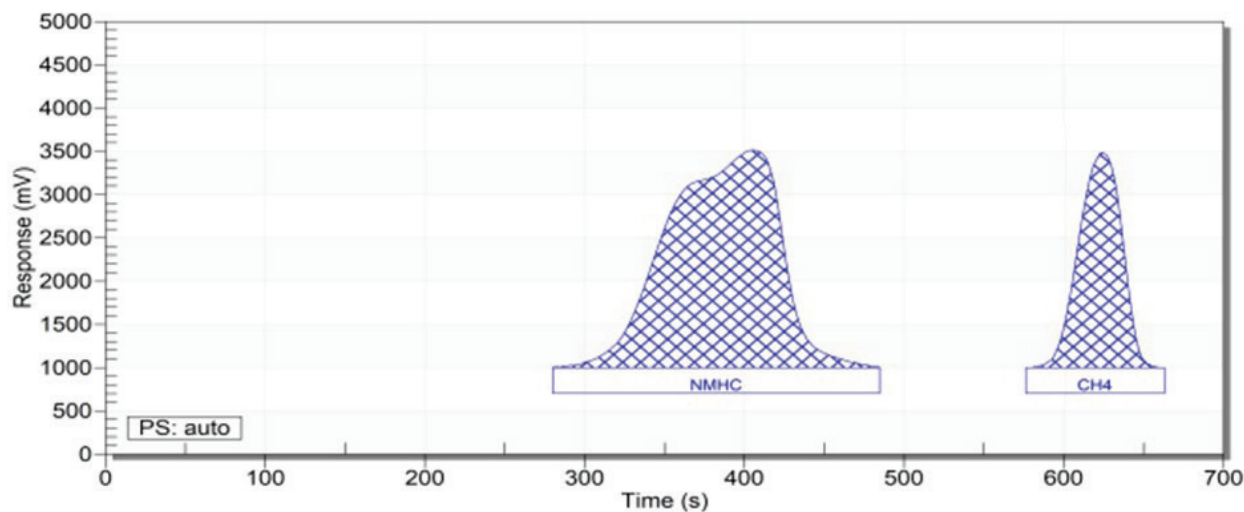
Dual train configured to focus on a fast analysis on one or few impurities from a sample gas containing multiple impurities.

Two chromatograms (Span calibration) of trace impurities NMHC-CH₄ and N₂ in balance gas UHP hydrogen (H₂). The first chromatogram in blue represents the first channel mounted in the MultiDetek3. The second chromatogram in green represents the second channel mounted in the same MultiDetek3. Each of the channel has a separated sample inlet port and an individual 2 streams selection valve to allow individual calibration of each module.

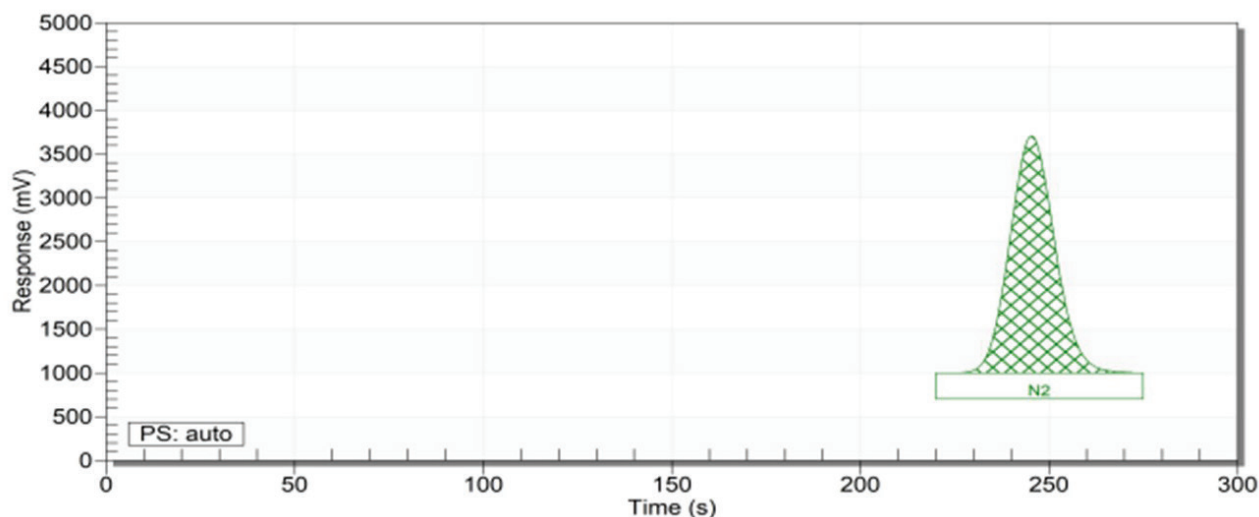
Since the N₂ analysis has been identified as more critical to allow to follow the quality of the gas produced, the N₂ reading can be updated every 300 seconds in the channel 2 while the NMHC-CH₄ channel is running in parallel and is updated every 700 seconds.

Based on its more critical impurity, the process can be updated very 5 minutes in this example by having a close look at the N₂ critical impurity. A second level quality measurement is performed by measuring NMHC-CH₄ every 12 minutes.

Chromatogram: Channel 1 for measuring trace NMHC-CH₄.



Chromatogram: Channel 2 for measuring trace N₂.



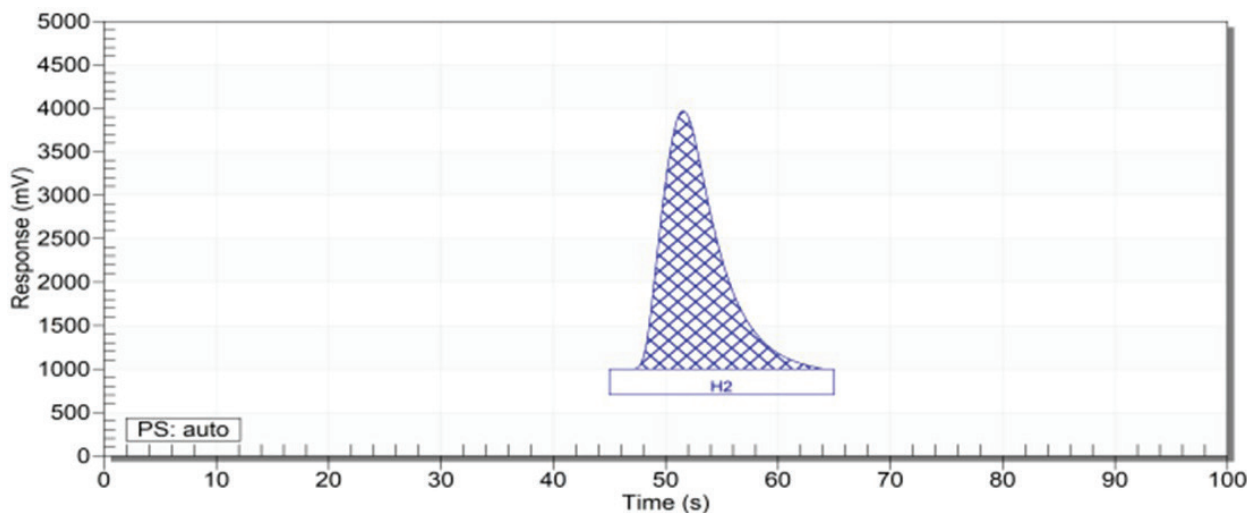
SOLUTION #2

Dual train configured to focus on a fast analysis of the same impurity(ies) from the same sample gas by having multiple channels in parallel.

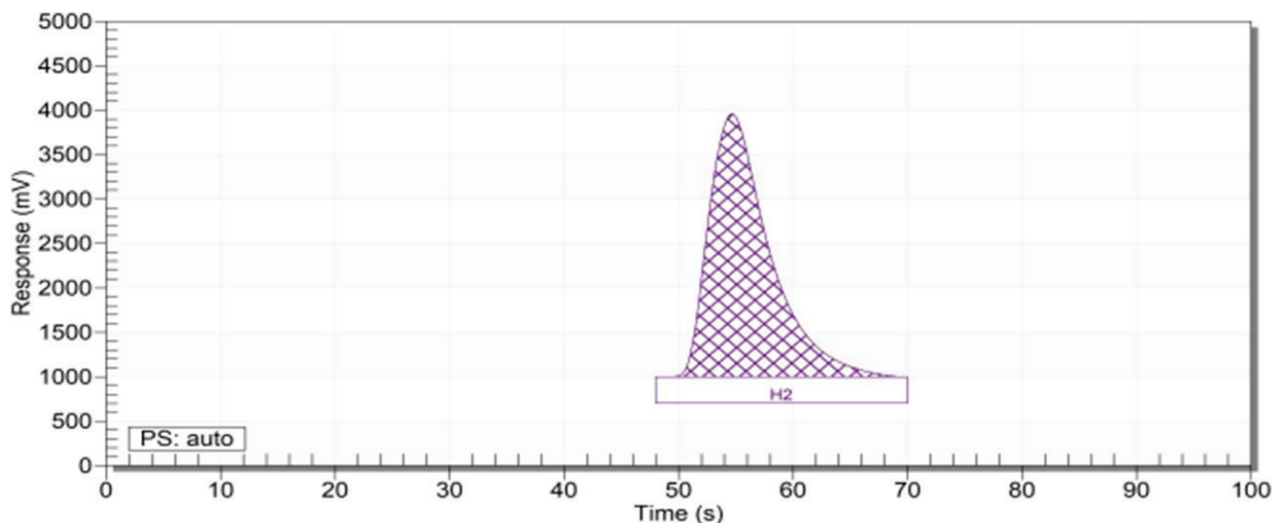
Two chromatograms (Span calibration) of trace impurity H₂ in balance gas UHP oxygen (O₂) produced by water electrolysis. The first chromatogram in blue represents the first channel mounted in the MultiDetek3. The second chromatogram in purple represents the second channel mounted in the same MultiDetek3. Each of the channel has a separated sample inlet port and an individual 2 streams selection valve to allow individual calibration of each module.

In this configuration, the h₂ peak is measured in the same sample gas in each channel. The analysis time for each channel is 70 seconds. The starting timing of the cycles has been offset to allow the h₂ reading to be refresh with a new measured value every 35 seconds instead of waiting the full analysis time of 70 seconds. As the process is critical and it is very important to have the h₂ reading updated the most frequent as possible, the dual train here has been optimized to achieve the requirements and offer an updated reading every 35 seconds.

Chromatogram: Channel 1 for measuring trace H₂.



Chromatogram: Channel 2 for measuring trace H₂.



SOLUTION #3

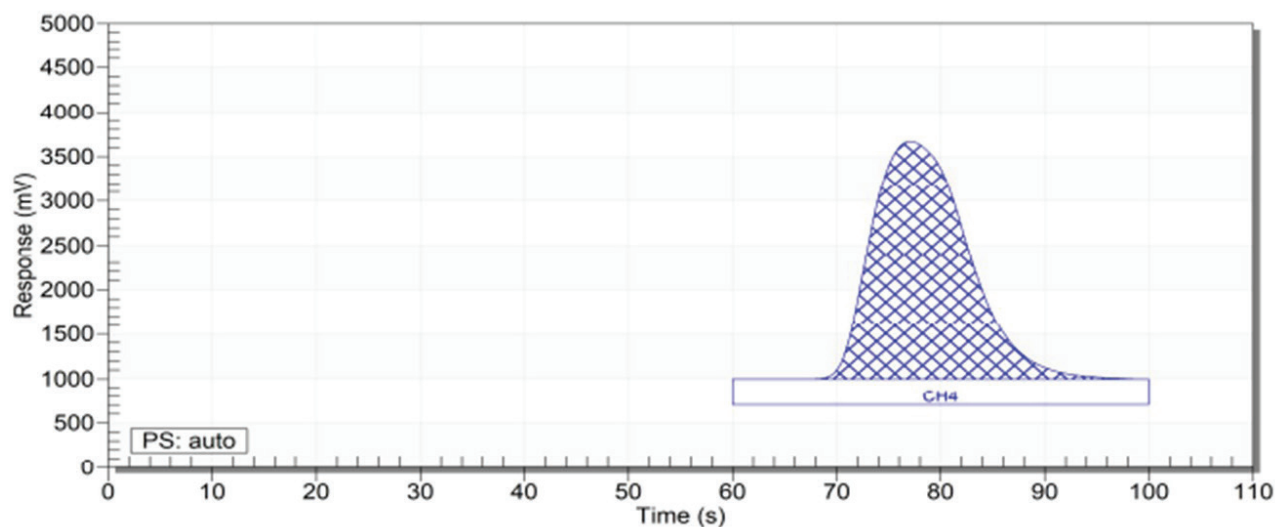
Dual train configured to measured different impurities from two different sample gases in the same unit. Like having 2 GCs in one unit.

Two chromatograms (Span calibration) of trace impurity CH₄ in balance gas UHP argon (Ar). The first chromatogram in blue represents the first channel mounted in the MultiDetek3. The second chromatogram in purple represents the second channel mounted in the same MultiDetek3. Each of the channel has a separated sample inlet port and an individual 2 streams selection valve to allow individual calibration of each module.

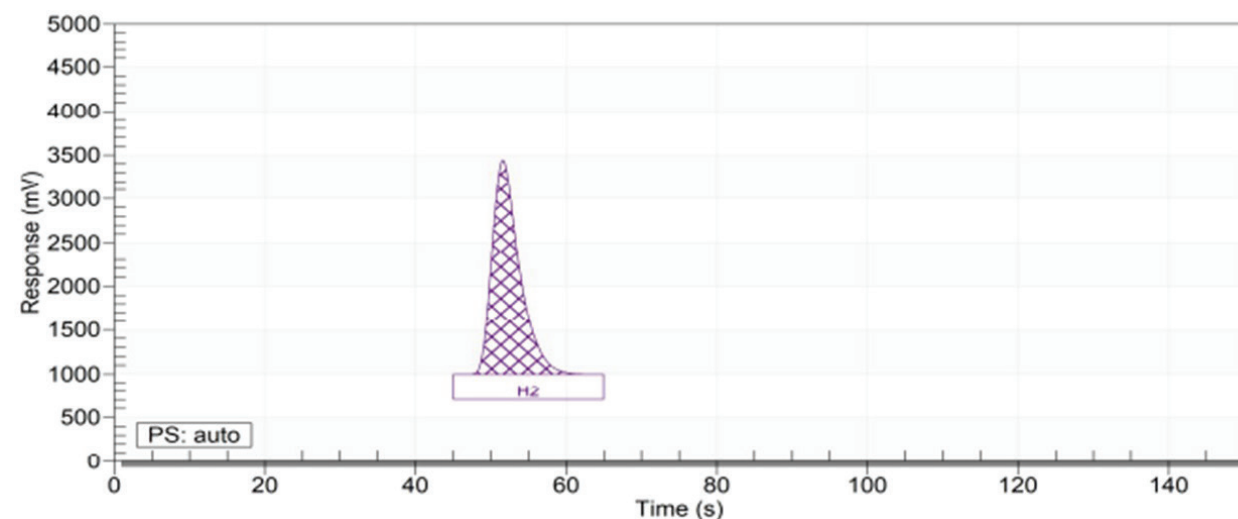
In gray, we see another example where channel 1 is used to measure N₂ in hydrogen while the channel 2 is used to measure from a different stream, the impurity H₂ from nitrogen sample.

In both examples, it demonstrate the cost saving of using the dual train feature to have 1 unit being able to measure impurities from two independent stream.

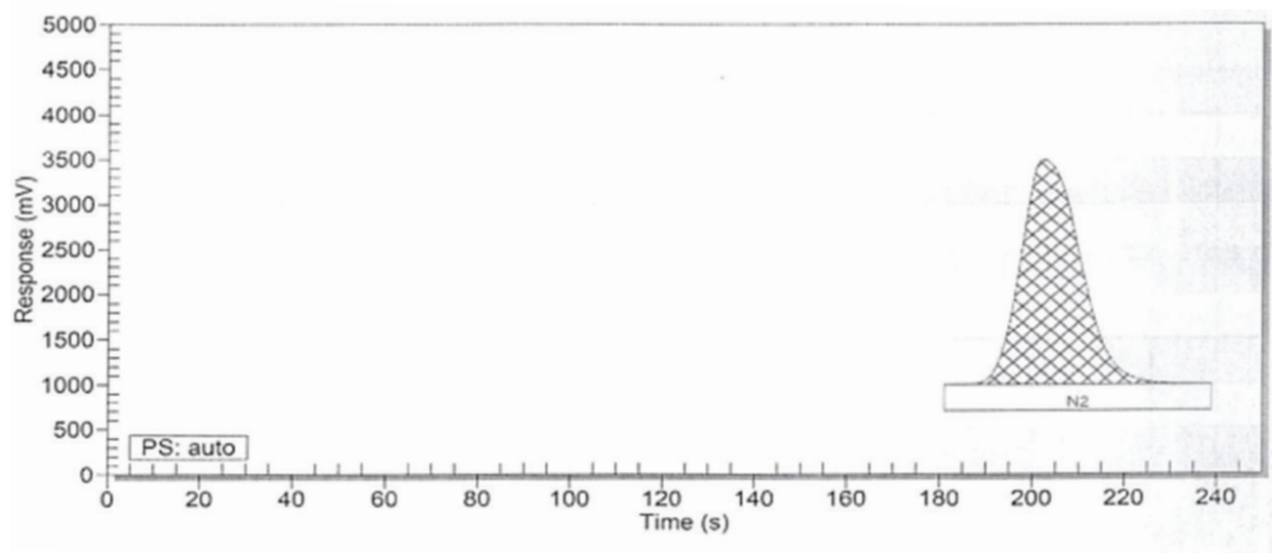
Chromatogram: Channel 1 for measuring trace CH₄ in Argon sample.



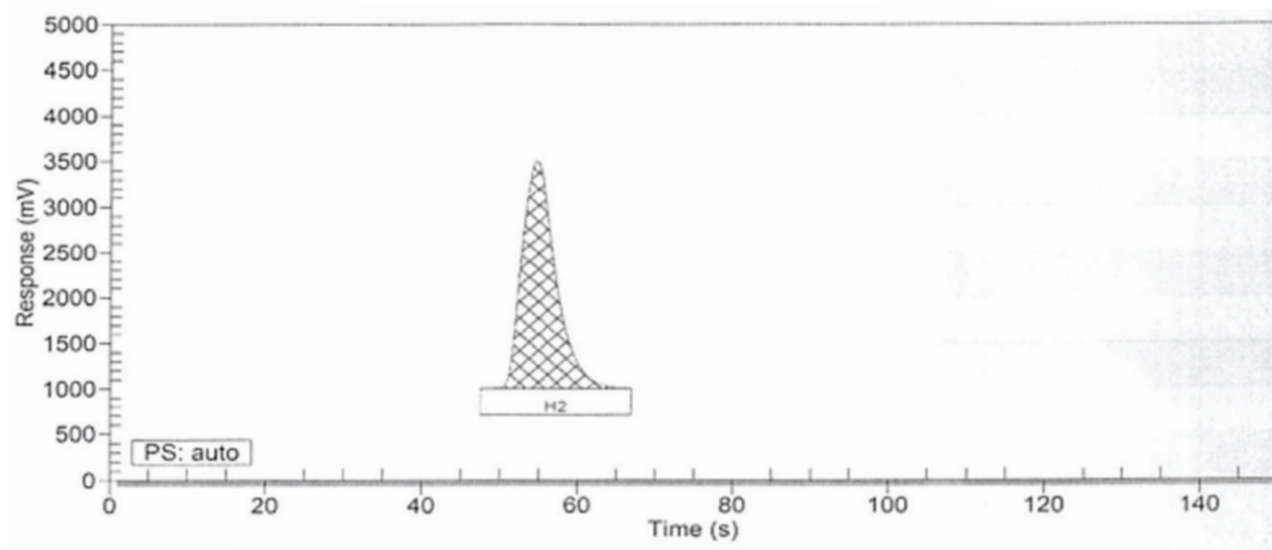
Chromatogram: Channel 2 for measuring trace H₂ in Nitrogen sample.



Chromatogram: Channel 1 for measuring trace N2 in Hydrogen sample.



Chromatogram: Channel 2 for measuring trace H2 in Nitrogen sample.



CONCLUSION

Using the double train feature of the MultiDetek3, the fast gas chromatography is possible. The applications where it is required to measure quickly to offer the best gas quality and better control the production process can now use this MultiDetek3 solution. As demonstrated in the document, the dual train can also allow a significant cost saving by offering the possibility to measure impurities from two independent gas stream into the same GC unit. That results of having two units in one.

The platform is perfectly adapted with individual features that make one unit to be operated as 2 units. The software's, the data, and all the hardware components are fully independent, including the communications protocols and the calibrations. That make the platform ideal to accelerate the analysis compared to a standard gas chromatograph. The analysis time can be 2 to 3 times faster depending on the applications.