

# Analysis of Permanent Gases and Extended Hydrocarbons in Natural Gas and Natural Gas Liquids by Capillary Gas Chromatography

## Application Note

Natural Gas Analyzer

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### Abstract

A gas chromatography method has been developed for the analysis of permanent gases and extended hydrocarbons in natural gas and natural gas liquids. The gas chromatograph configuration consists of two channels. One channel is configured with a liquid and gas sample valve in series with a split inlet and a microfluidics Capillary Flow Technology (CFT) Deans Switch configured with an HP-PLOT Q and a Molsieve PLOT capillary column interfaced with a single thermal conductivity detector (TCD). The TCD channel is used for the analysis of permanent gases and light hydrocarbons. The second channel is configured with a liquid and gas sample valve in series with a split inlet and DB-1 column interfaced with a flame ionization detector (FID) for the analysis of extended hydrocarbons. This configuration allows for the analysis of both permanent gases and extended hydrocarbons in natural gas, natural gas liquids (NGL), or liquefied petroleum gas (LPG) in single analysis using capillary columns.



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## Introduction

The Agilent Technologies Application Note 5991-2063EN [1] describes a CFT Deans Switch configuration with a single TCD capable of analyzing permanent gases and hydrocarbons in natural gas, see the chromatogram in Figure 1.

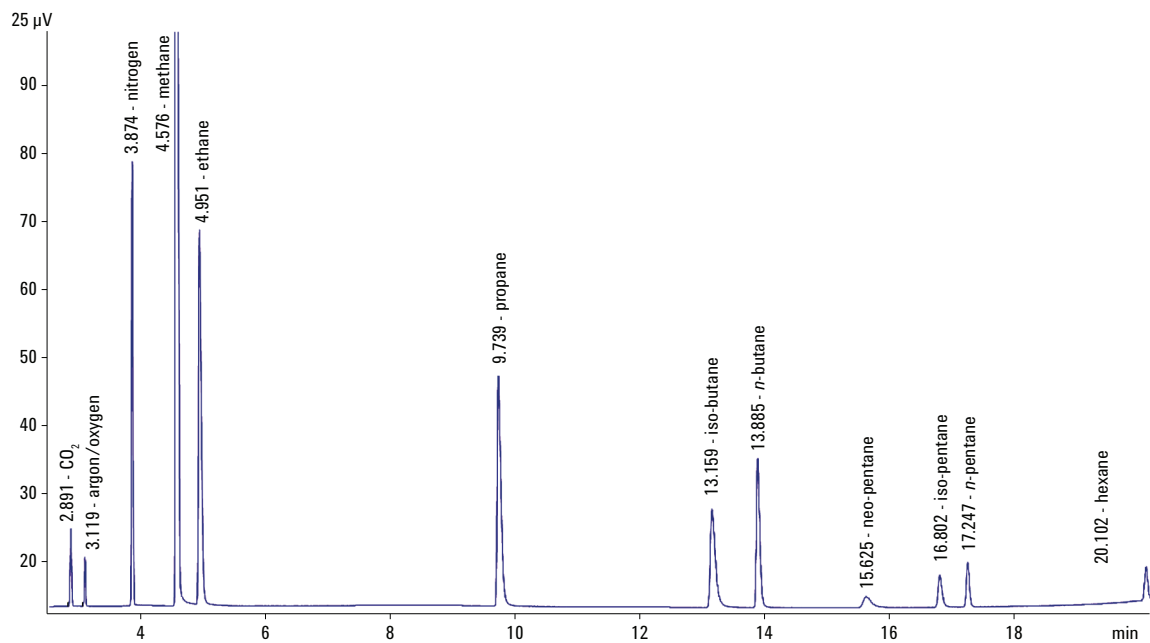


Figure 1. Single TCD Deans Switch Chromatogram from Application Note 5991-2063EN.

By adding the second FID channel to this configuration, an extended hydrocarbon analysis is achieved in parallel, see the chromatogram in Figure 2. This configuration provides entry into a capillary column equivalent to GPA 2186 [2]. The advantage of this system is that it allows the analysis of gas phase and liquid phase samples and provides better resolution, precision, and sensitivity using PLOT columns for the permanent gas analysis. The system is highly configurable. The TCD channel allows the separation of all permanent gases, can be extended to analyze out through C<sub>6</sub> on the PLOT Q column, and allows for the inclusion of an FID channel for the analysis of extended hydrocarbons.

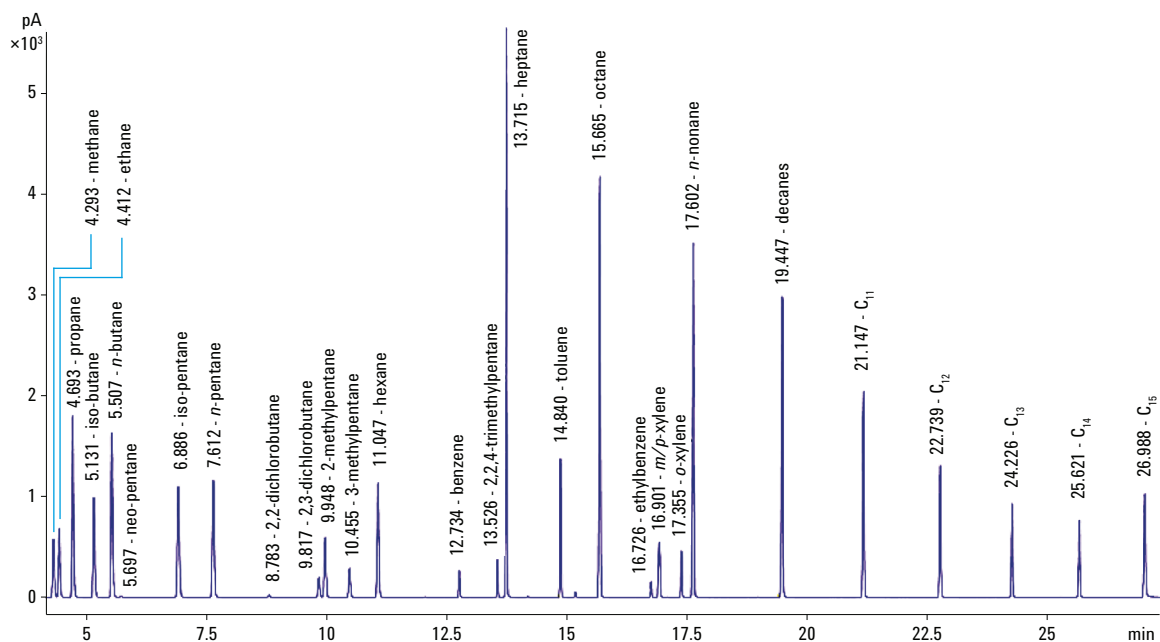


Figure 2. Analysis of Extended Hydrocarbons in Natural Gas from the FID Channel.

This configuration gave the results shown in Figure 3, demonstrating the full analysis of permanent gases and extended hydrocarbons from an LNG sample. The analysis of a gas phase sample can be obtained by a second method where the sample is injected through the GSV's instead of the LSV's.

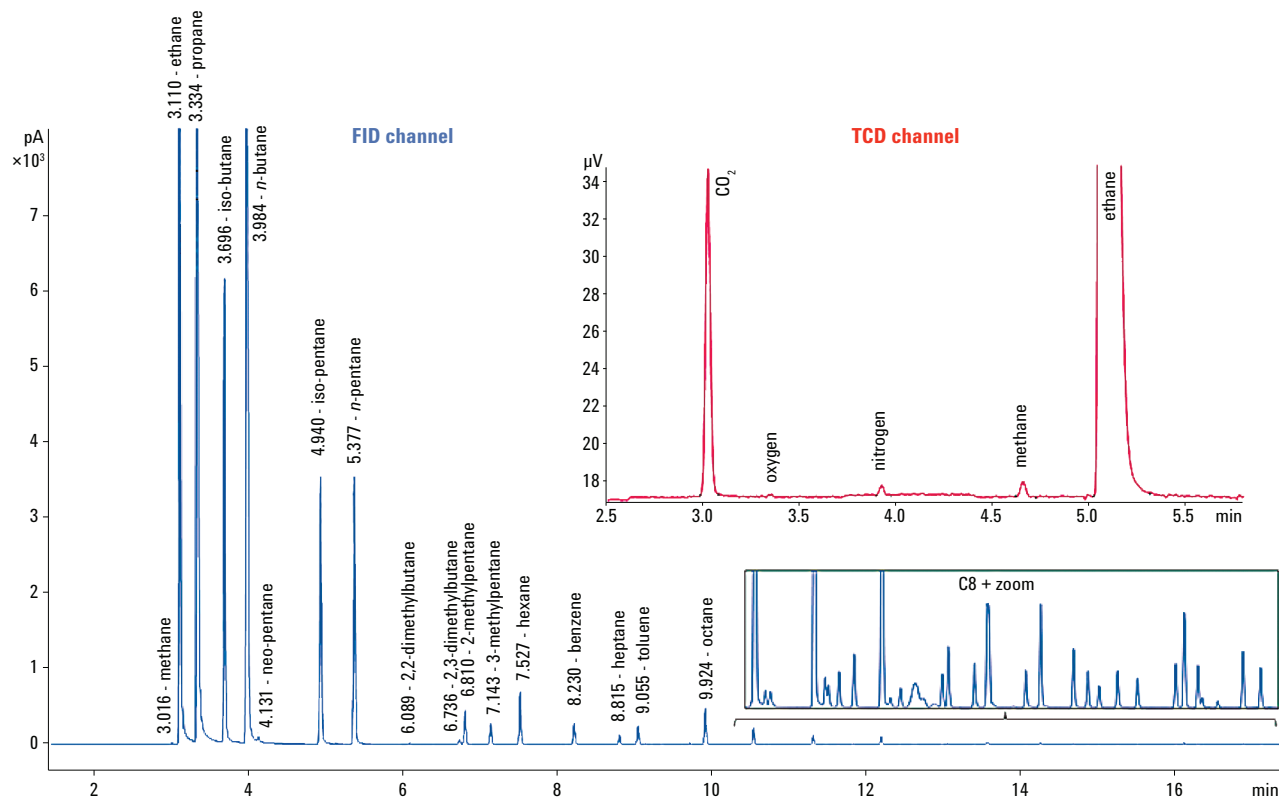


Figure 3. FID channel extended analysis.

## Conclusion

Using a Capillary Flow Technology Deans Switch configured with a single TCD provides an effective way to analyze permanent gases in LNG, LPG and gas phase samples. The approach provides a flexible analysis with easy method setup, with the flexibility to add a second channel such as the extended hydrocarbon analysis discussed. The use of capillary columns improves speed, precision, resolution and sensitivity compared to the packed column methods that are typically used for this analysis. The system is configurable with either gas sample valves, liquid sample valves, or both liquid and gas sample valves for analysis of a variety of sample phases in a single analysis.

## References

1. K. Beard, S. Coleman, "Single Detector Deans Switch Natural Gas Analysis with Resolution of Oxygen and Nitrogen", Agilent Technologies Publication 5991-2063EN, March, 2013.
2. GPA Standard 2186, "Method for the Extended Analysis of Hydrocarbon Liquid Mixtures Containing Nitrogen and Carbon Dioxide by Temperature Programmed Gas Chromatography", Gas Processors Association, 6526 East 60th Street, Tulsa, Ok 74145.

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