09-112-7024EN
Application note

Detailed analysis of C1 through C10 hydrocarbons in stabilized crude oil and petroleum distillates

Summary

Light component of the crude oil is used as raw material for various secondary refining processes and petrochemical plants, therefore, it is of particular importance to know individual and group composition.

The analyzer allows easy determining of detailed hydrocarbon analysis in stabilized crude oil.

Light end-fraction is determined in accordance with the test procedure as per ASTM D 7900-13, IP 601. Separation and processing is similar to well-known test methods ASTM D5134 and ASTM D6729. Detailed hydrocarbon analysis reports groups of hydrocarbons, such as Paraffins, Isoparaffins, Naphthenes, Olefins, Aromatics (PIONA) is carried out; heavy fractions are separated in pre-column and backflushed.

Data reported in the Light-end determination can be easily consolidated with the results of boiling range distribution of crude oil and petroleum distillates determined by ASTM D6352-12 or ASTM D7169-11 utilizing Chromatec SimDist application software.

Analysis methods

1. ASTM D7900-13. Standard test method for determination of light hydrocarbons in stabilized crude oils by gas chromatography.
2. IP 601: Determination of light hydrocarbons in stabilized crude oils - Gas chromatography method
3. ASTM D5134-13. Standard test method for detailed analysis of petroleum naphthas through n-nonane by capillary gas chromatography.
4. ASTM D6729-14. Standard Test Method for Determination of Individual Components in Spark Ignition Engine Fuels by 100 Metre Capillary High Resolution Gas Chromatography.

Instrument configuration

- Gas chromatograph Chromatec-Crystal 9000
- Capillary Inlet (Split/Splitless)
- FID detector
- Pre-column backflush option (includes 3-port fused silica splitter and EPC channel for programmable switching)
- Oven ventilation unit (OVU option).
- Chromatographic column DB-1
  100 m × 0.25 mm × 0.5 um or other similar columns
- Autosampler AS-2M
- Chromatec Simdist Software or Chromatec DHA software

Operating mode

Run time	120 min
Column	
Carrier gas pressure	300 kPa
Split ratio	1:90
Column temperature	
Isotherm 1 35 °C	13 min 10°C/ min
Isotherm 2 45 °C	15 min 1°C
Isotherm 3 60 °C	15 min 2°C
Isotherm 4 200 °C	20 min
Split-Splitless inlet	
Temperature	250°C
FID detector	
Hydrogen flow rate	25 ml/min
Air flow rate	250 ml/min
Makeup gas flow rate	25 ml/min
Detector temperature	275°C

Pre-column 0.5m length
Switching time for backflushing ≈1.0 min (to be determined)

Experiment

Light-end fraction determination

Device for determination of crude oil light fraction with backflushing (Figure 1).

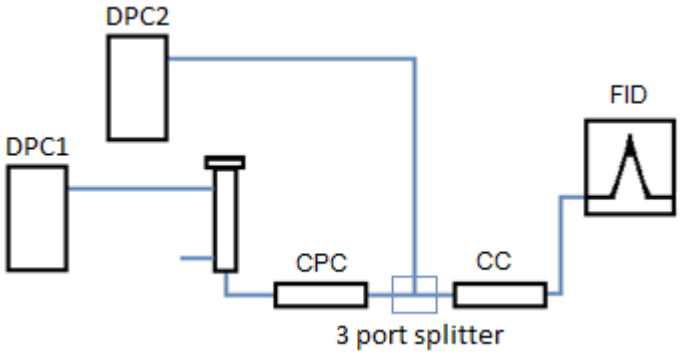

Figure 1 – Backflushing diagram

While passing through the capillary pre-column (CPC), light hydrocarbons enter the main capillary column (CC) for separation (Figures 2A, 2B). By DPC1 and DPC2 programming, the system switches to backflushing at the moment when the last targeted component enters the main column. In the example Figure 2, the last components is C12.

3-port splitter is a Silflow micro-fluidic platform utilizing chemically inert sample path, finger tight metal ferrules combined with reliable zero dead volume connection of capillary. Backflushing option guarantees precise switching and good peak shapes at precolumn programmable switching.

Chromatograms

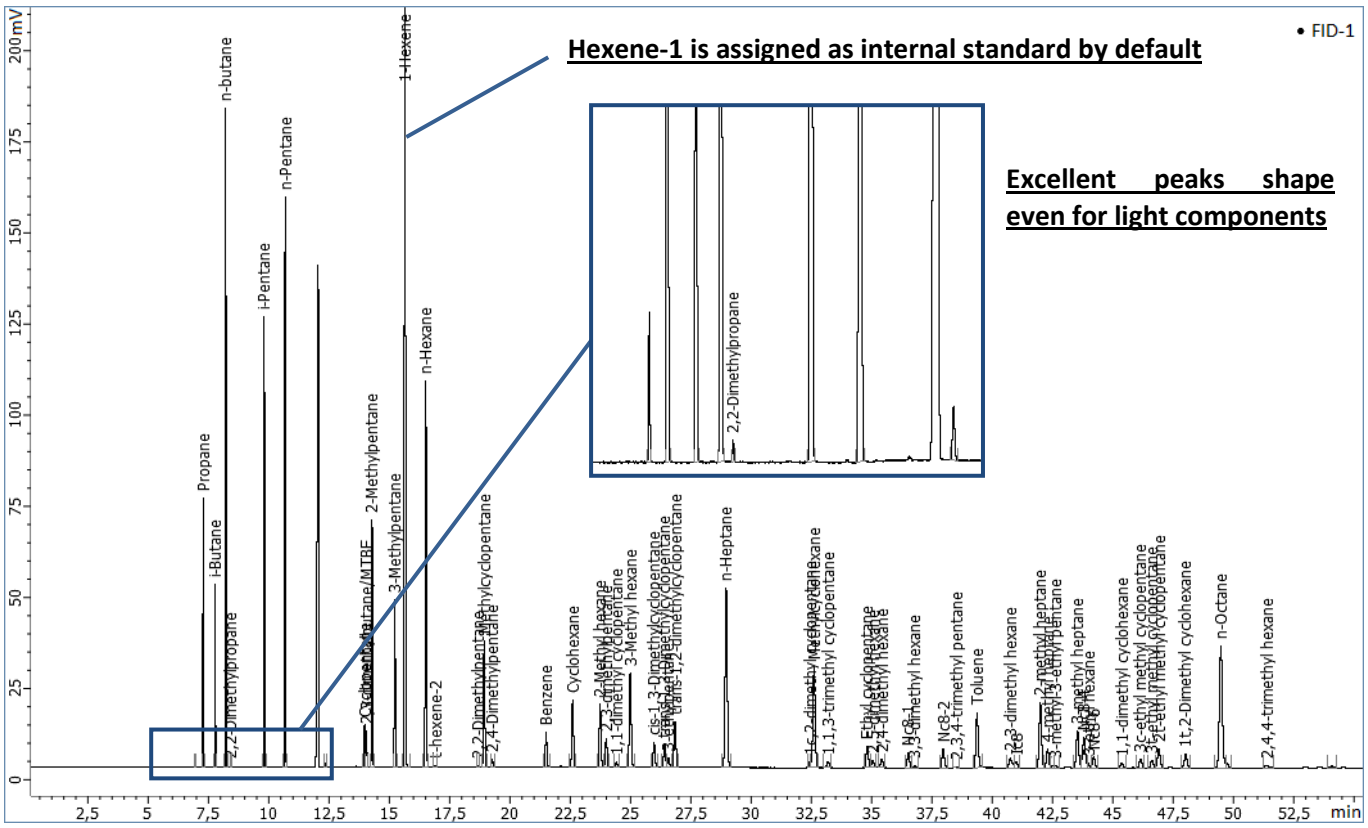

Figure 2A – Chromatogram of light fraction (First part)

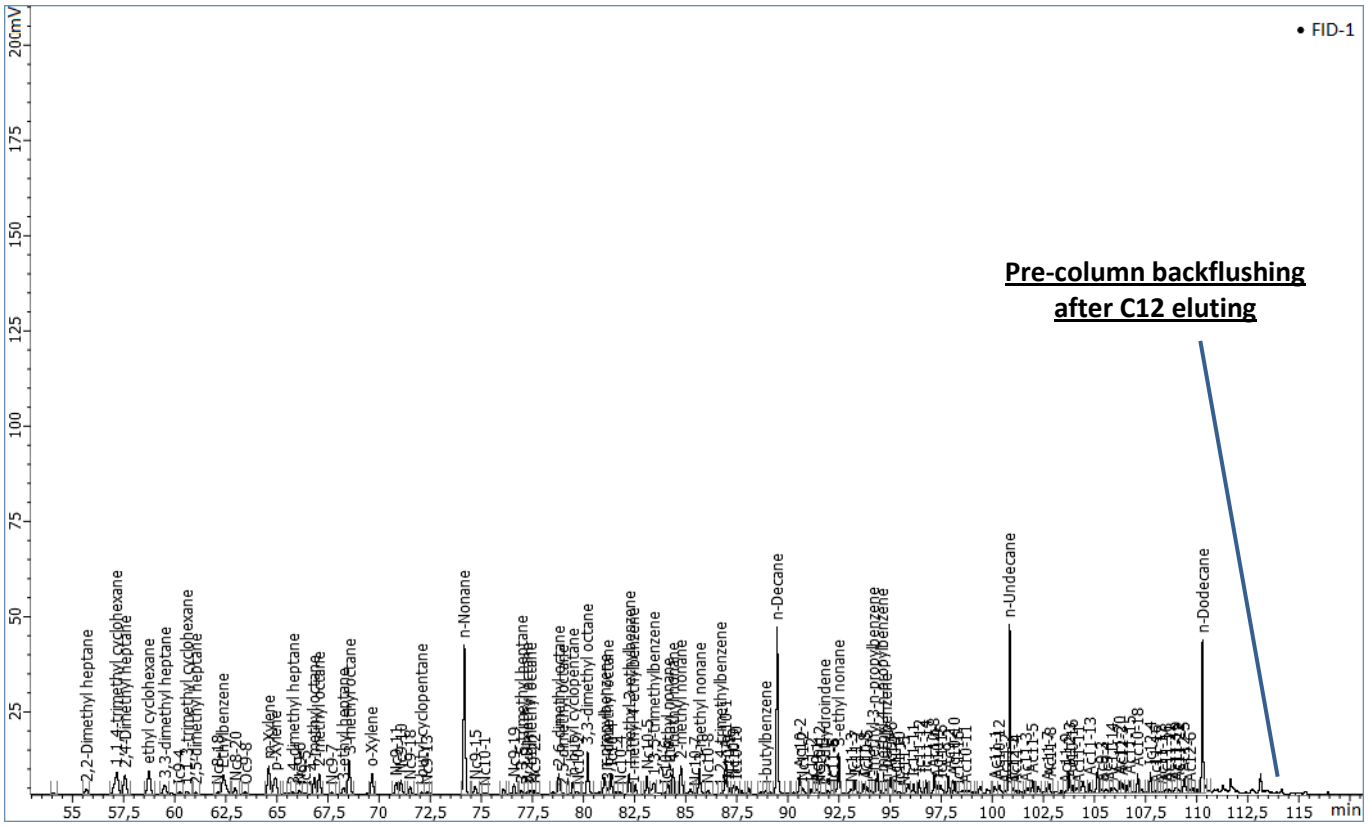

Figure 2B - Chromatogram of light fraction (Second part)

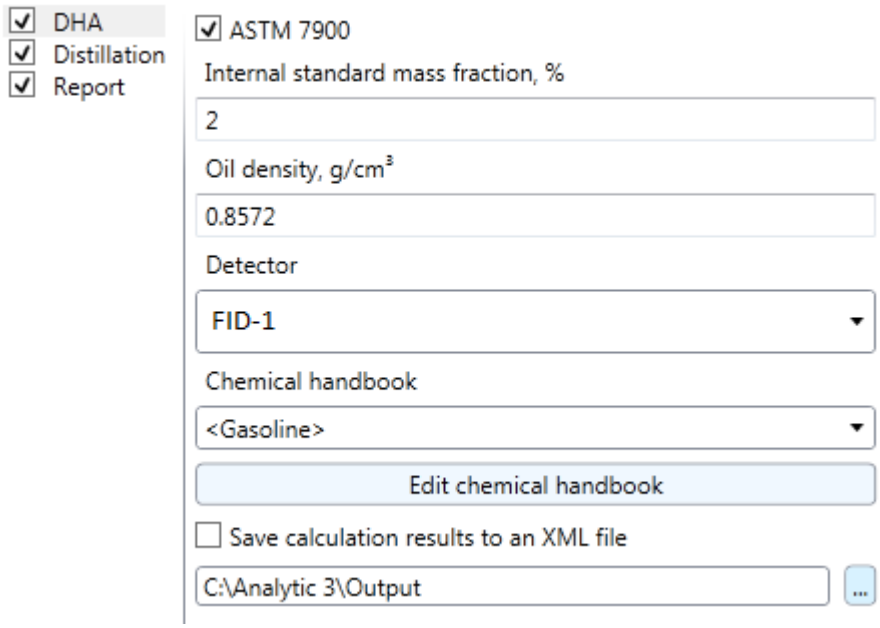

Figure 3 – Setting interface for DHA of light fraction