



Analysis of Aromatic Hydrocarbons in Middle Distillates with HPLC using IP Standard Method 391/95

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Abstract

The performance of diesel fuel is predominantly determined by its ignition quality. This parameter is known as the Cetan number. The Cetan number describes how much Vol.% Cetan (hexadecane) is present in a mixture of Cetan and 1-Methylnaphthalene. Generally, in order to provide the best performance and lifetime of an engine, the amount of aromatics in diesel should be as low as possible.

For the analysis of non-aromatics and aromatics in diesel fuel and petroleum distillates boiling in the range 150 °C to 400 °C, there exists an IP Method (391/95), which uses HPLC with refractive index detection. The two compound classes (aromatics and non-aromatics) were separated using normal phase HPLC and a column which has little affinity for non-aromatic but pronounced selectivity for aromatic hydrocarbons. In order to avoid long retention times due to late elution of polyaromatic hydrocarbons (PAHs) the column was backflushed after the elution of the di-aromatic hydrocarbons to elute the PAHs as a single sharp band. The refractive index detector was used because this detector responds to both non-aromatic and aromatic hydrocarbons.

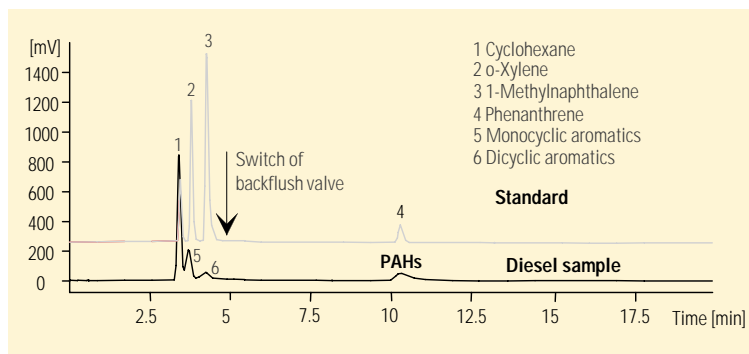


Figure 1
Standard chromatogram

Conditions

Column 200 x 4.6 mm AP NH₂, 5 μm

Mobile Phase Heptane

Flow Rate 0.8 ml/min

Injection Vol 2 μl

Oven Temp 20 °C

Backflush on 5 min

Refractive index detector

Sample preparation

1 g diesel sample filled to 10 ml with heptane



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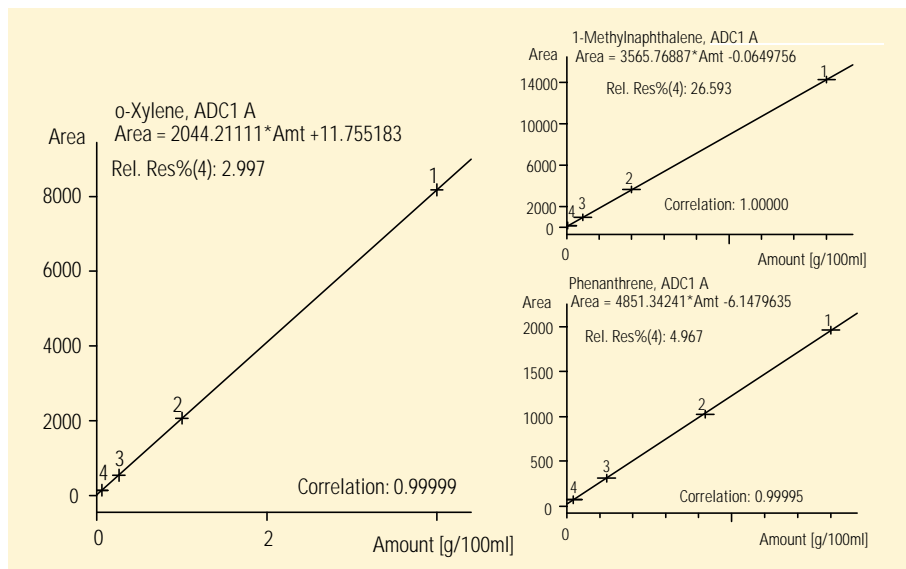


Figure 2
Linearity

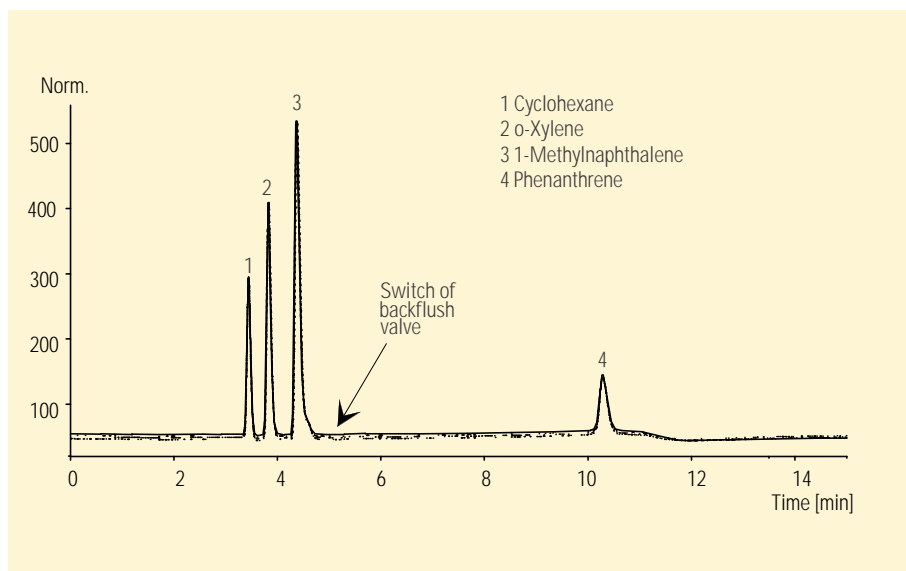


Figure 3
Repeatability—overlay of 5 runs

Method performance

Application range:

4–40 % m/m monocyclic aromatics

0–20 % m/m dicyclic aromatics

0–6 % m/m polyaromatics

4–65 % m/m total aromatic hydrocarbons

Precision of amounts:

rsd = 0.35 % for monocyclic aromatics

rsd = 0.23 % for dicyclic aromatics

rsd = 0.59 % for PAHs

Equipment

Agilent 1100 Series

- vacuum degasser
 - isocratic pump head seal for normal phase:
Agilent Part number 0905–1420
 - autosampler
 - thermostatted column compartment and backflush valve HP 1047
 - refractive index detector
- Agilent ChemStation + HPLC software

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