APPLICATION NOTE

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ANALYTICAL CONTROLS
by **PAC**

Determination of 2-EthylHexylNitrate in Diesel Fuels by Gas Chromatography

- **Robust Analysis with Deans Switch Technology**
- **Excellent Repeatability & Linearity**
- **No sample preparation**
- **Quantification range 50 – 4000 ppm**

Keywords:
2-EthylHexylNitrate (2-EHN), Cetane Improver, Diesel , Deans switch

ANALYSIS

The sample is introduced through the Split/Splitless inlet on the first column. 2-EHN including co-eluting compounds are diverted to the second column by Deans heart-cutting (fig 2). On the second column, the 2-EHN is separated from the co-eluting compounds (fig 3). Detection is done by the Flame Ionization Detector.
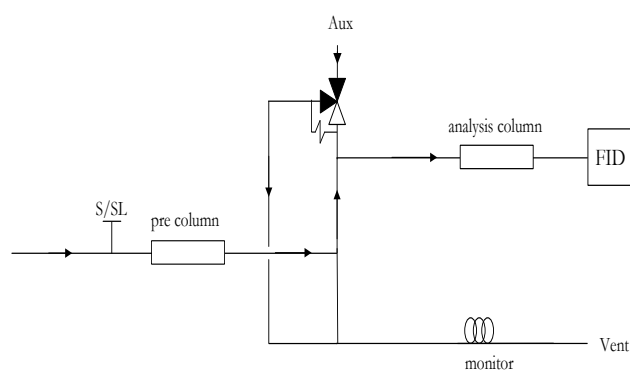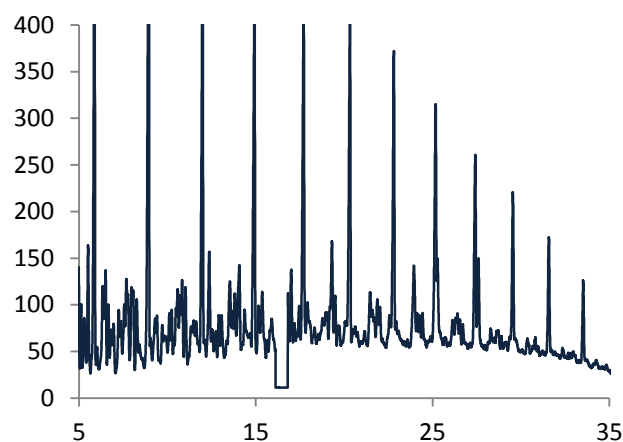

Figure 1: Flow diagram 2-EHN in diesel on 6850 GC

INTRODUCTION

2 – EthylHexylNitrate (2-EHN) is the most widely used Cetane improver for Diesel. 2-EHN improves fuel efficiency and increase Cetane Numbers of Diesel, thus offering larger flexibility to refiners to improve diesel fuel quality and maximizing refinery yields. AC Analytical Controls provides an accurate and precise total solution for the determination of 2-EHN in diesel.

SOLUTION

In complex sample matrixes like Diesel, single column applications often do not allow enough resolution to determine compound(s) of interest. The presented solution consists of a two dimensional column set-up in a Deans switch configuration. The Deans heart cut with different stationary phases in each dimension allows sufficient resolution required to determine 2-EHN in diesel fuels.
This set-up allows neat sample injection and eliminates the need for sample preparation prior to injection.

Figure 2: Precolumn separation, Heart-cutting (Monitor column connected to FID)

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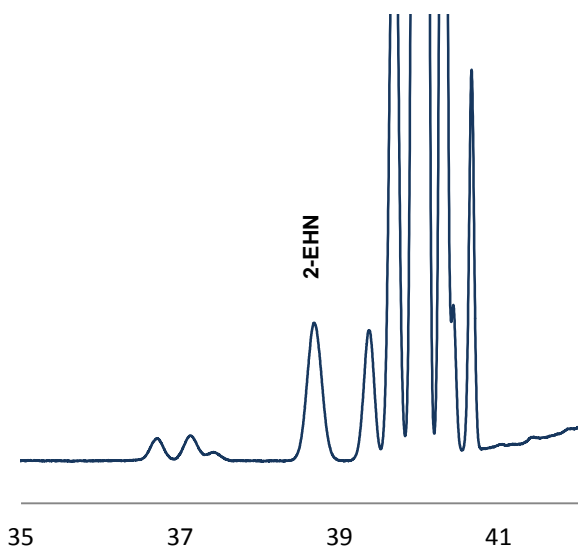
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Figure 3: Separation of 100 ppm 2–EHN in diesel on analytical column

REPEATABILITY

The Concentration and Retention time repeatability of the application are determined using a 790 ppm Wt standard solution of 2-EHN in diesel. Results are summarized in Table 1)

	Concentration (ppm Wt)	Retention Time (min)
Average	787.8	38.73
Stdev	1.4	0.02
RSD %	0.2	0.04

Table 1: Repeatability of analysis (n=10)

LINEARITY

The linearity of the system is checked using gravimetric standards. The Standards are prepared between 50 and 4000 ppm WT. The linear correlation of 0.9999 indicates a linear behavior over 3 orders of magnitude
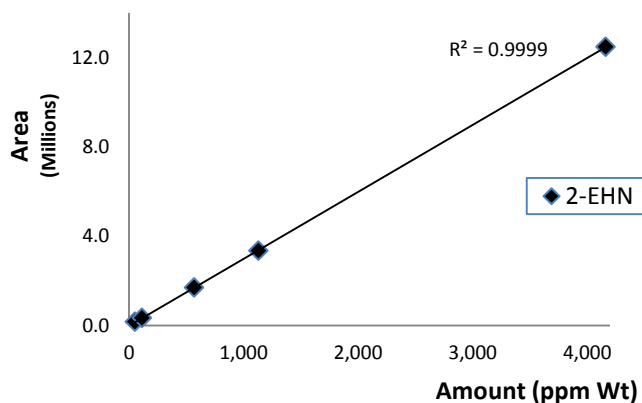

Figure 4: Linearity of analysis

CONCLUSION

The use of Deans configuration in combination with selected optimized stationary phases has resulted in a very robust and sensitive method for the analysis of 2-EHN in Diesel. Specifications are listed in Table 2.
The application provides the separation required to successfully eliminated any sample treatment prior to analysis, and make analysis of 2-EHN truly easy.

Matrix	Diesel
Compound	2-EHN
Quantification range (mg/kg)	50 - 4000
Linearity (R^2)	> 0.999
Repeatability	< 1% RSD
Retention time stability	< 0.1% RSD

Table 2: Analysis Specifications

AC Analytical Controls® has been the recognized leader in chromatography analyzers for gas, naphtha and gasoline streams in crude oil refining since 1981. AC also provides technology for residuals analysis for the hydrocarbon processing industry. Applications cover the entire spectrum of petroleum, petrochemical and refinery, gas and natural gas analysis; ACs Turn-Key Application solutions include the AC Reformulyzer ® , DHA, SimDis, NGA, Hi-Speed RGA and Customized instruments.

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