

Hydrocarbon Oil Index Determination in Water Using a Simple, Cost-Effective System

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Key Words

AI/AS 1310 Autosampler, Chromeleon CDS, TRACE 1310, Gas Chromatography, Hydrocarbon Oil Index, PTV Injector Module, Water Analysis

Hydrocarbon contamination in water is generally assessed using gas chromatography with a flame ionization detector (FID). Official methods dictate all of the necessary steps for sample gathering, conservation, extraction, and purification starting with water collected from the test site. The methods also set out qualitative requirements for chromatography and how standards are to be prepared for the identification of compounds of interest.

The chromatographic conditions and setup are relatively flexible, provided that the results, in terms of discrimination, match the standards outlined in the methods.

Here, we present a simple solution to perform this kind of analysis. It relies on a Thermo Scientific™ TRACE™ 1310 gas chromatograph (GC) equipped with an instant connect FID module, a programmed temperature vaporizing (PTV) injector module, and an AI/AS 1310 autosampler controlled by Thermo Scientific™ Dionex™ Chromeleon™ 7.2 Chromatography Data System (CDS) software. With this instrument configuration, a GC run can be completed in less than 10 minutes. The PTV module guarantees no or negligible discrimination between the lightest and the heaviest compounds. The sensitivity is guaranteed up to the official method limit (EN ISO 9377-2).

Experimental

The discrimination tests and the ramp setup were assessed using a Florida hydrocarbon mix (Figure 1).

The results of this discrimination test show that this method is suitable for the determination of hydrocarbons with a retention time between those of C10 and C40: the relative response of C40 versus C20 should be above 0.8.

The extraction and purification of the sample is not described in this application note, but can be found in the official method.



Instrumental Conditions

Injection Volume: 1 µL

TRACE 1310 GC

Carrier Gas: Helium, constant flow, 4 mL/min

Column Type: TG-5 15 m, 0.25 mm, 0.25 µm (P/N 260E130P)

Column Oven: Initial 40 °C, hold 0.5 min, ramp at 50 °C/min up to 350 °C, hold 1.3 min

Instant Connect PTV Injector

Inlet Temperature: 50 °C

Mode: Split mode, flow 80 mL/min, split ratio 20:1

Ramp Settings: Injection time 0.2 min, transfer ramp 14.5 °C/min to 350 °C, hold 2 min

Instant Connect FID

Temperature: 350 °C

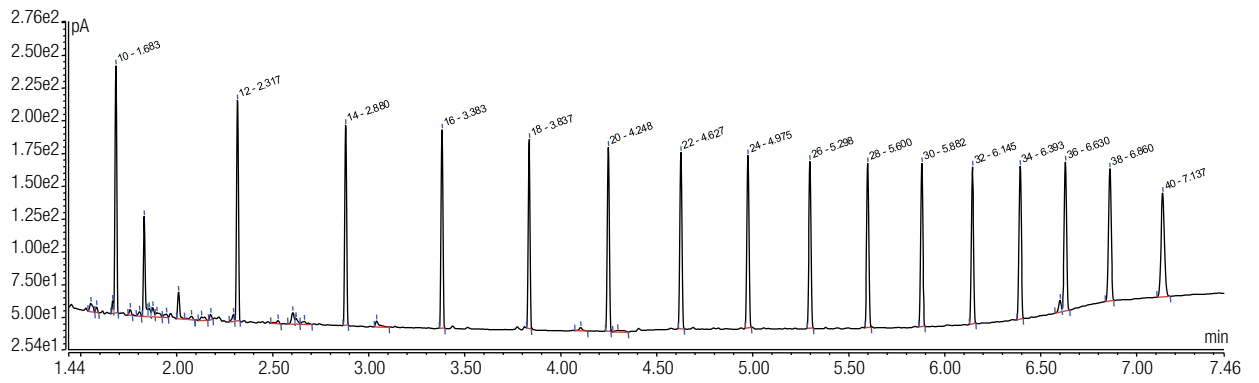


Figure 1. Discrimination test using Florida hydrocarbon mix.

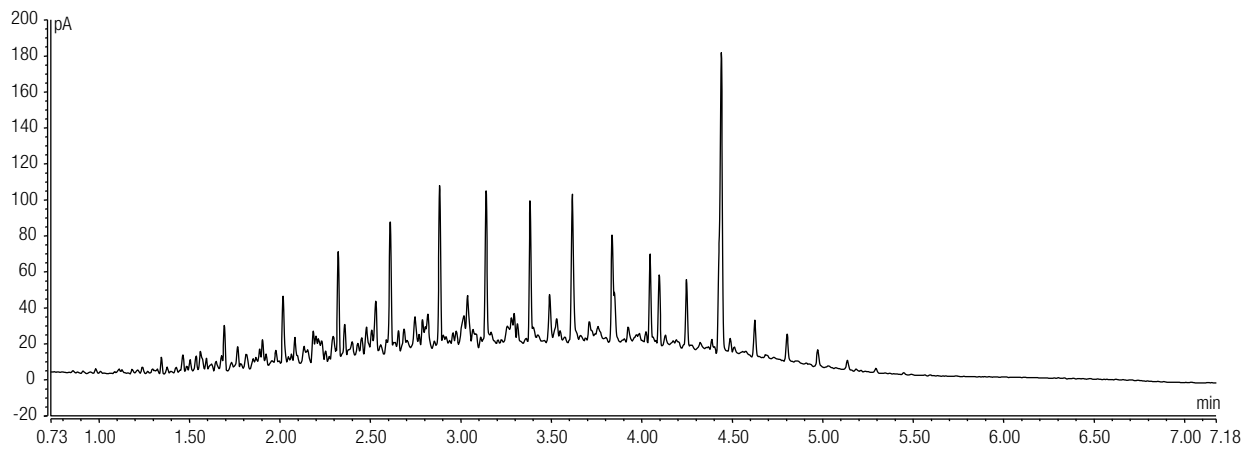


Figure 2. A chromatogram of a diesel sample in hexane at 1 mg/mL.

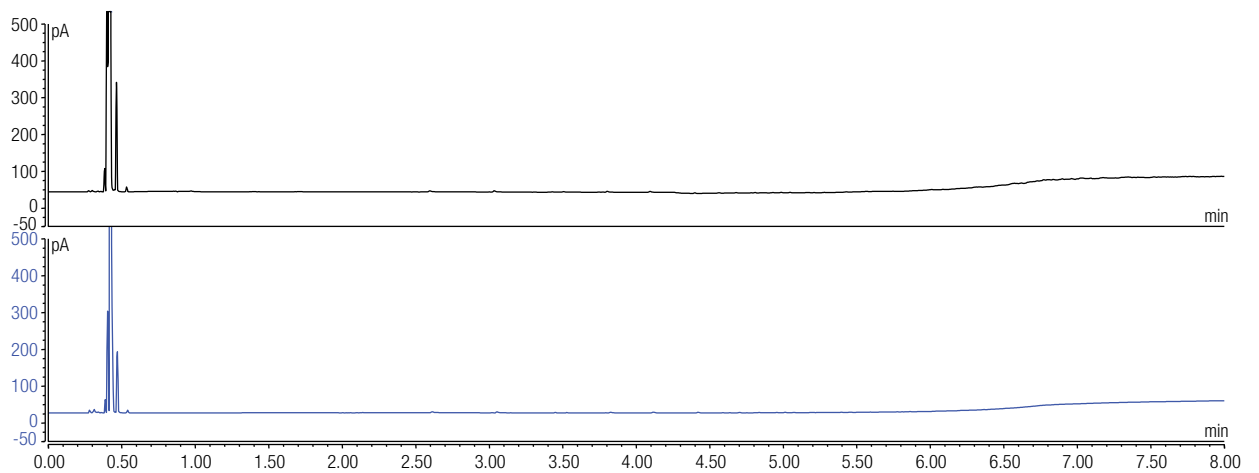


Figure 3. A blank injection before and after a consecutive series of samples at 1 mg/mL.

Results

Samples were quantified by integrating all the peaks between C10 and C40. A seven-point calibration curve was built with the following concentrations 0, 0.1, 0.2, 0.4, 0.6, 0.8, 1 mg/mL. The r^2 for the resulting calibration was 0.99.

The Florida hydrocarbon mix was used to assess the reproducibility of the system. The results are reported in Table 1.

The absence of carryover was also assessed. The baseline was checked after 10 consecutive injections of the highest calibration point (Figure 3).

Conclusions

The system described here represents a valid option for the determination of the Hydrocarbon Oil Index in water. The solid chromatographic result, coupled with the brief GC runtime and the 155 autosampler positions, allows high productivity. The discrimination-free inlet system, represented by the instant connect PTV, offers reliable and reproducible results over the range of analyzed hydrocarbons. The Chromeleon CDS software offers an intelligent and convenient solution for data acquisition and reprocessing. Its simple and powerful report system can be customized to incorporate the calculations dictated by the official method for computing the results.

Table 1. Reproducibility when running Florida hydrocarbon mix.

Compound	Area RSD%	Retention Time Standard Deviation
7 Injections		
C10	1.94	0.001
C12	1.49	0.001
C14	1.53	0.001
C16	1.69	0.001
C18	1.58	0.001
C20	1.64	0.001
C22	1.80	0.001
C24	1.75	0.001
C26	1.83	0.001
C28	1.87	0.001
C30	1.93	0.002
C32	1.91	0.001
C34	1.87	0.001
C36	1.93	0.001
C38	2.04	0.001
C40	2.21	0.002

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