

## Cutting Down Analysis Times with the Anatune GC XLR8R

Diane Turner, Anatune Ltd., Hardwick, Cambridgeshire, UK

### Introduction

The GC XLR8R is an innovative accessory that boosts the heating power of Agilent gas chromatographs. It is fully integrated within the GC temperature control with no additional software to run it, so that after installation the method is set-up as usual through the keypad or using Chemstation – the only difference being that much faster oven temperature ramps can be achieved! The GC XLR8R heater is inserted into the bottom of the GC oven and the one or two columns are installed hanging on their baskets in the centre of the oven, no special columns are necessary so current methods can very simply be speeded-up without having to re-develop them due to changes in column configuration, etc. The GC XLR8R can be used for many applications in many fields of work – wherever GC run times are limited by the oven temperature ramp rate.

Presented here are the results from the analysis of total petroleum hydrocarbons (TPHs). The oven temperature was programmed from 50°C to 250°C at a rate of 120°C/min, then to 300°C at 100°C/min then to 350°C at 90°C/min, a cycle time of just over 9 minutes is achieved. A Florida mix containing even number C8-C40 hydrocarbons was used to test the robustness and reproducibility of the GC XLR8R (a total of 826 injections were made). A column was selected that separated the pristane and phytane biomarkers in diesel from C17 and C18, while still performing the total analysis in 3.52mins with C40 at a retention time of 3.296 mins. A calibration was performed along with the analysis of CRM samples.

### Instrumentation and Methods

- Anatune GC XLR8R
- Agilent 6890N Gas Chromatograph with FID
- Agilent Chemstation
- Gerstel Multi-Purpose Sampler

### Results

The analysis time of TPHs was found to be greatly reduced using the GC XLR8R with a GC run time of 3.5 minutes and a cycle time of just over 9 minutes, while still achieving separation of C8 from the solvent peak and the pristane and phytane biomarkers from C17 and C18 respectively (Figure 2).

The reproducibility of the oven ramping was found to be very good, with retention time deviations over the course of a run (20 injections) of less than 0.061% for C10-C40, see Table 1.

The GC XLR8R was found to be robust over a long period of time; Table 1 shows the retention time deviation of a random 37 injections over 200 runs.

By starting the oven at 50°C C8 can be separated from the solvent if DCM or hexane is used, see Figure 1, while a fast GC cycle time of just over 9 minutes can still be achieved (the use of cryo cooling on the oven could slightly reduce this). The C40 peak elutes just before the end of the final oven temperature ramp, therefore the final hold time depends on if the column needs to be baked to remove compounds less volatile than C40.

A quick calibration (with manual integration) showed good linearity see Figure 4. Analysis of duplicate CRM extracts, Figure 3, gave results of 2409 mg/kg within the certified range of 1990-2684 mg/kg.

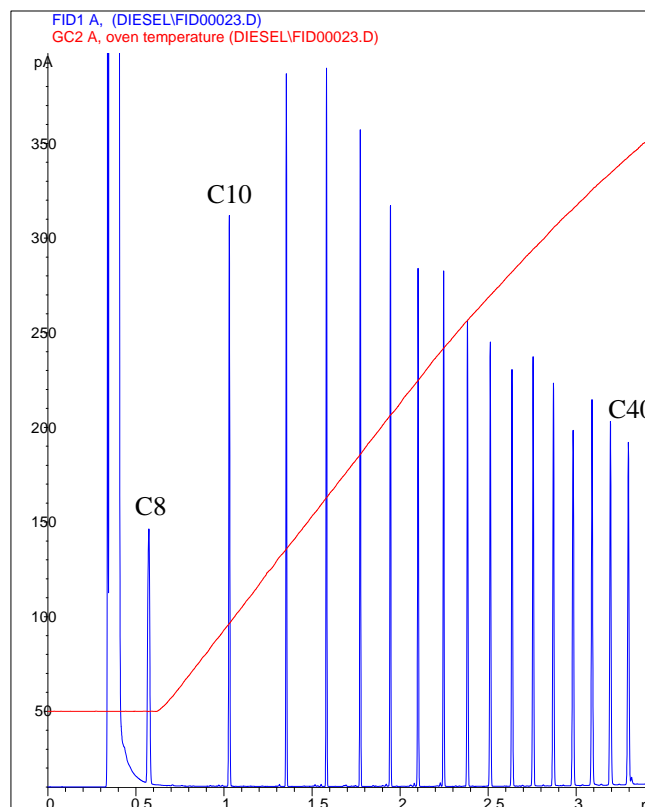


Figure 1: Florida mix (~100ppm) in DCM-Hexane C8-C40 hydrocarbons even numbers; GC oven temperature profile overlaid in red

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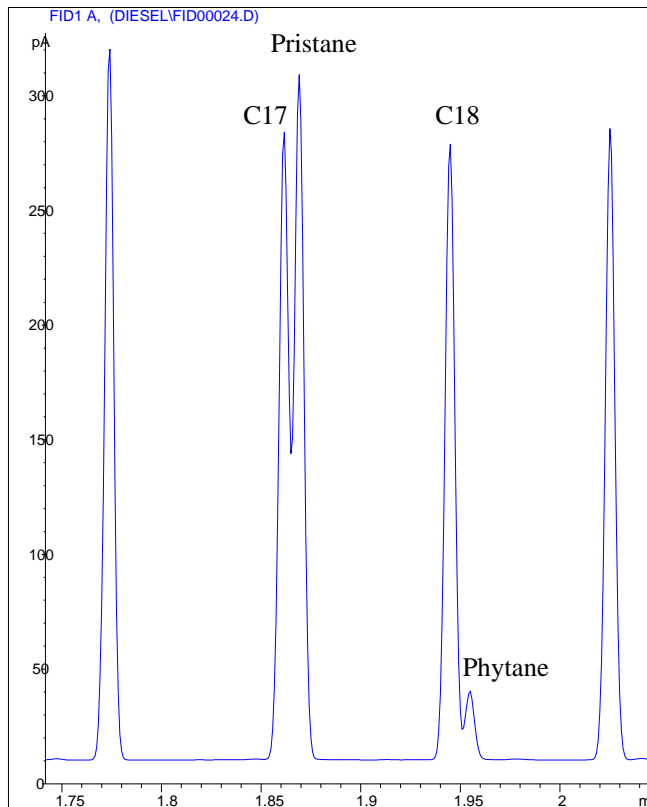


Figure 2: DRO mix (C10-C25 hydrocarbons) (~100ppm) + pristane (~100ppm) + phytane (~10ppm) in iso-octane

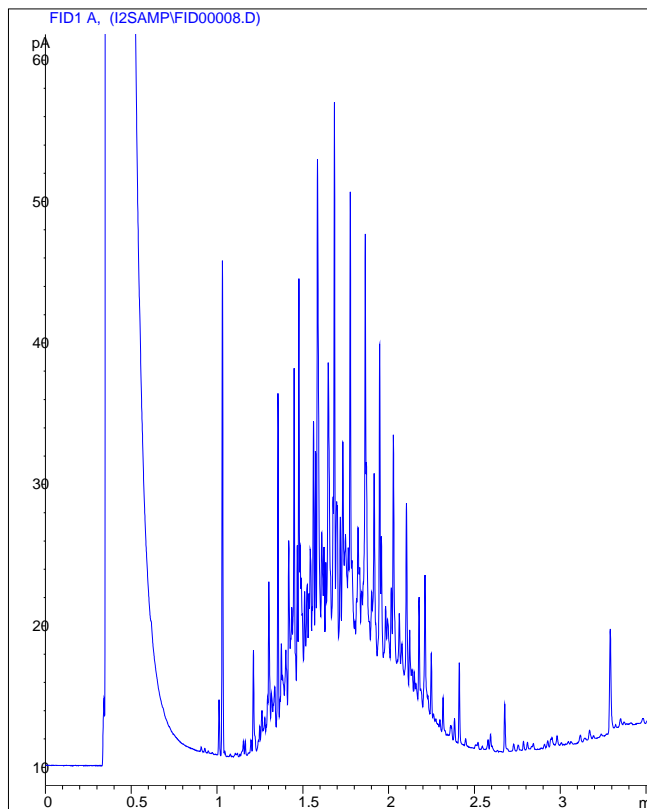


Figure 3: Soil CRM standard at 240 ppm (2409 mg/kg)

Hydrocarbon number	Retention time (mins)	%RSD last 20 injections	%RSD random 37 injections over 200 runs
C8	0.574	0.140	0.222
C10	1.030	0.060	0.092
C12	1.354	0.061	0.097
C14	1.582	0.048	0.104
C16	1.774	0.059	0.086
C18	1.945	0.048	0.072
C20	2.102	0.047	0.071
C22	2.247	0.047	0.079
C24	2.383	0.048	0.081
C26	2.512	0.052	0.079
C28	2.635	0.056	0.064
C30	2.755	0.050	0.058
C32	2.871	0.040	0.055
C34	2.982	0.038	0.052
C36	3.090	0.053	0.058
C38	3.194	0.038	0.051
C40	3.296	0.045	0.073

Table 1: Retention time deviations for Florida mix

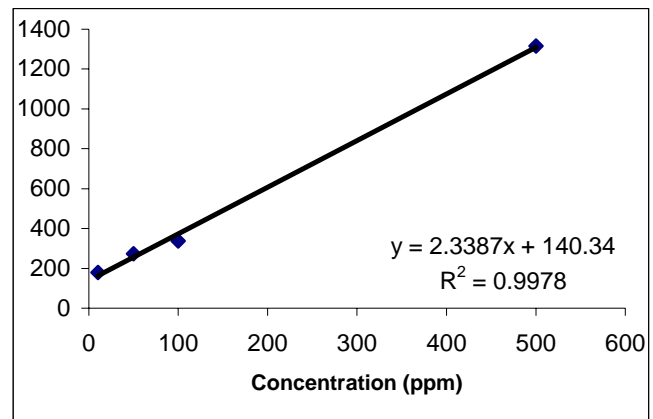


Figure 4: TPH calibration curve 10-500 ppm

### Conclusions

The GC XLR8R can greatly reduce GC run times through the ability to ramp the GC oven quickly. It is a simple GC accessory which is both reproducible and robust.

This method can be used for the determination of TPHs between C8 and C40 with or without biomarker identification. The method run time could be reduced further depending on the target analytes required for the analysis.

### Acknowledgements

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