

Case Study.

Determination of alcohol in crude oil, condensates, and produced water

The Case.

James Hutton Limited was approached by an oil company client interested in determining the levels of methanol and ethanol in export crude oil, condensate and crude water samples. Methanol and ethanol (as industrial methylated spirits) are sometimes injected as hydrate inhibitors and are largely removed from the export oil by a separation process into the produced water.

Some alcohol however does remain in the exported oil, some in solution and some associated with the remaining water. The problem for the oil company is that downline the refinery uses catalysts which are easily poisoned by these alcohols (with very expensive consequences), so they need to know when the slug of alcohol is due to arrive at the refinery and at what level in order to take remedial action.

The Approach.

James Hutton Limited developed a method that was specific for the alcohols and robust for oils of various types and for water samples.

Crude oil has hundreds of components, many of which coelute with ethanol and methanol by conventional Gas Chromatography with Flame Ionisation Detection (GC-FID). We can eliminate the majority of interfering compounds by extracting the oil into water (the alcohols partition very well in to the water from the oil, most hydrocarbons don't).

The remaining interferences are overcome by the use of Static Equilibrium Headspace Gas Chromatography with Single Ion Monitoring Mass Spectrometry.

This enables the measurement of ions specific to methanol and ethanol e.g. the quantitation ion for both alcohols is m/z 31 and this is not present in benzene which is a major interference with, co-eluting with methanol. The use of Head Space analysis, which samples the gas in the space above the extract can be analysed without further clean-up therefore minimising contamination of the GC-MS system. We have several GC and GC-MS systems together with innovative sampling systems such as the Headspace Sampler. Experience of the capabilities of the instrumentation and knowledge of the expected behaviour of the crude oil components made this analysis possible.



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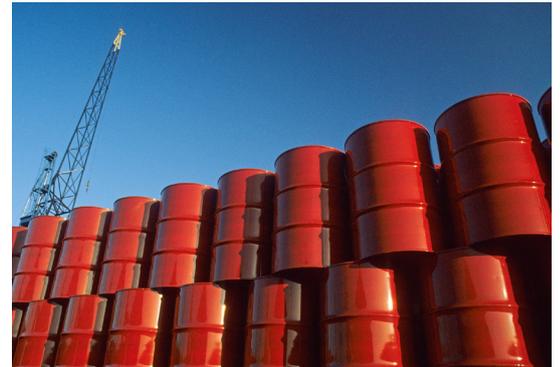
The Cost-Saving Outcome.

James Hutton limited has carried out this type of analysis for several major oil companies interested in the partitioning of alcohols between crude oil/condensates and produced water.

The clients have been able to pinpoint exact times that the slug of alcohol containing oil was sent down the pipeline and the approximate concentration, such that the refinery could be prepared to divert the flow into a holding tank for pre-treatment.

The cost saving to the client and down-line to the refinery will far outweigh the costs of analysis (the client is penalised the refining company for every litre of alcohol contained in the exported crude oil).

In addition to simple measurement, we have used this technique as an integral part of developing protocols and running laboratory partitioning experiments for oil companies so that they can better understand the behaviour of alcohols in water/oil mixtures under a variety of conditions and develop models to optimise the separation process.



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