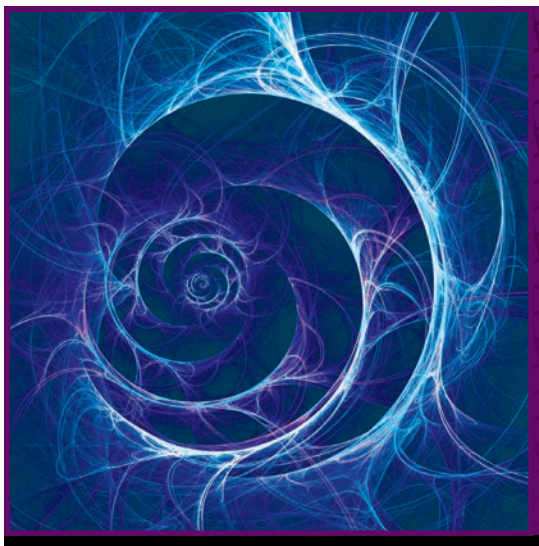

Hydrocarbon Testing—an Important Analysis Throughout the Petrochemical Industry

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Measuring oil content in wastes is nothing new to the petrochemical industry. Whether it is produced water from onshore or offshore sites, effluents from refineriers, or drill cuttings and drilling mud, limits on hydrocarbon levels need to be met. With the increase of hydraulic fracturing in the US, more public attention has been focused on the need for regulations and limits. In addition to increasing where tests are required there is also a need for more flexible testing equipment that can handle different oil concentration ranges as well as liquids, slurries and solids.

Hydraulic fracturing wastes

At a hydraulic fracturing site, water and wastewater management practices are driven by both cost and regulations. If the cost of fresh water is low, there is little impetuous to reclaim the flowback or produced water for reuse. In most regions of the US, reinjection into disposal wells is the lowest cost option for flowback and produced water. In arid areas where fresh water costs are high and there are concerns of depleting aquifers, water reuse is becoming an economic option.

Another factor in waste management is the impact of truck traffic in areas that previously had little industrial activity. The first year of a new well can require over 2000 truck trips. Reducing incoming and outgoing water to a well site satisfies both the fear of using up public water supplies and truck traffic issues, making water recycling and reuse more attractive.

Wastewater management options include removal to an off-site treatment facility, evaporation ponds, reuse for hydrofracking and treatment for surface discharge. Each option has maximum levels of free or dissolved oil that will be accepted making oil removal the first step in wastewater handling. Along with oil removal is the need to test oil in water levels to ensure required levels have been attained.

Measuring oil and grease levels can be done on-site with portable infrared analysers. Filter-based infrared oil in water/soil analysers, as shown in Figure 1, have been used in the oil industry for more than 40 years, predominantly on offshore rigs for produced water testing where equipment needs to be rugged and reliable. A test can be done on-site in less than 15 minutes without having to incur the cost and delay of off-site laboratory analysis. An added benefit is that this simplified technology does not require a skilled laboratory technician to do the analysis.

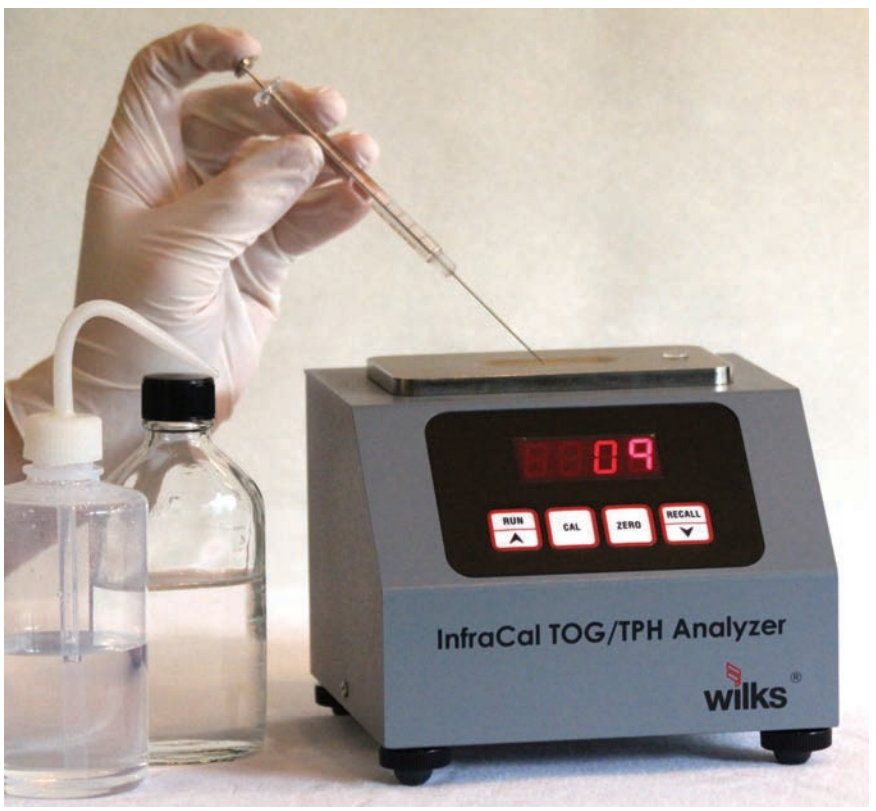

Figure 1: InfraCal TOG-TPH Analyzer

Drill cutting and mud wastes

Solid wastes from drilling are typically handled by overboard disposal, reinjection, land application, pit burial, off-site treatment or reuse for road surfaces or filler in concrete. Again, each option usually requires testing oil contaminants. Testing initial oil levels or the efficiency of the oil removal system can be done on-site with the same infrared analyser as listed above for oil in water testing. The levels for cuttings are typically in the 0.5% – 10% range, well above the ppm requirements for oil in water. Going from ppm levels up to percent levels with the same sampling system can be an analysis challenge.

Figure 2: New InfraCal 2 Analyzer

Sub-ppm to percent level infrared measurements

Wilks Enterprise has developed procedures that allow for a full range of analyses with the new InfraCal 2 Analyzer (Figure 2). This analyser provides the capability to have multiple calibrations to cover percent down to sub-ppm levels.

A horizontal ATR sample stage using hexane, pentane or cyclohexane as the extraction solvent can be used for oil in water levels from 0.3 to 5000 ppm range. The hydrocarbon solvent is evaporated off and the infrared absorbance due to the residual oil film is measured.

The same ATR sample stage can be used for the higher 0.5%-10% range found in drill cuttings or muds. The sample is diluted by using a solvent that does not have an infrared absorbance at the hydrocarbon wavelength such as tetrachloroethylene or S-316 (dimer/trimer of chlorotrifluorethylene) and therefore does not require evaporation. The same analyser can also be used for TPH in soil if a spill or pond leak occurs to determine the extent of contamination.

For measurements where it is important to detect volatile hydrocarbons, IR transparent solvents such as tetrachloroethylene or S-316 allow for direct measurement in the solvent without an evaporation step. A cuvette holder sample stage is utilised for these solvents.

Conclusion

A quick and simple on-site infrared oil and grease measurement gives the petrochemical industry a useful tool for:

- Optimising frac water treatment procedures
- Maximising evaporation pond efficiency
- Meeting off-site treatment facilities requirements
- Complying with drill cuttings disposal regulations
- Ensuring that produced water is under the regulatory limit
- Assessing soil contamination.
- Oil content measurements in under 15 minutes eliminating the wait for off-site results

Expanded capabilities now give operators the ability to cover the range of oil and grease measurements needed using one portable instrument with the same field-proven technology that has been used worldwide both offshore and onshore for decades.