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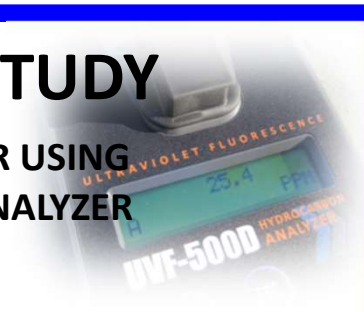
Esbjerg, Denmark
UVF-500D.COM

PERFORMANCE STUDY

TESTING CRUDE OIL IN WATER USING UVF-500D HYDROCARBON ANALYZER



Project Description

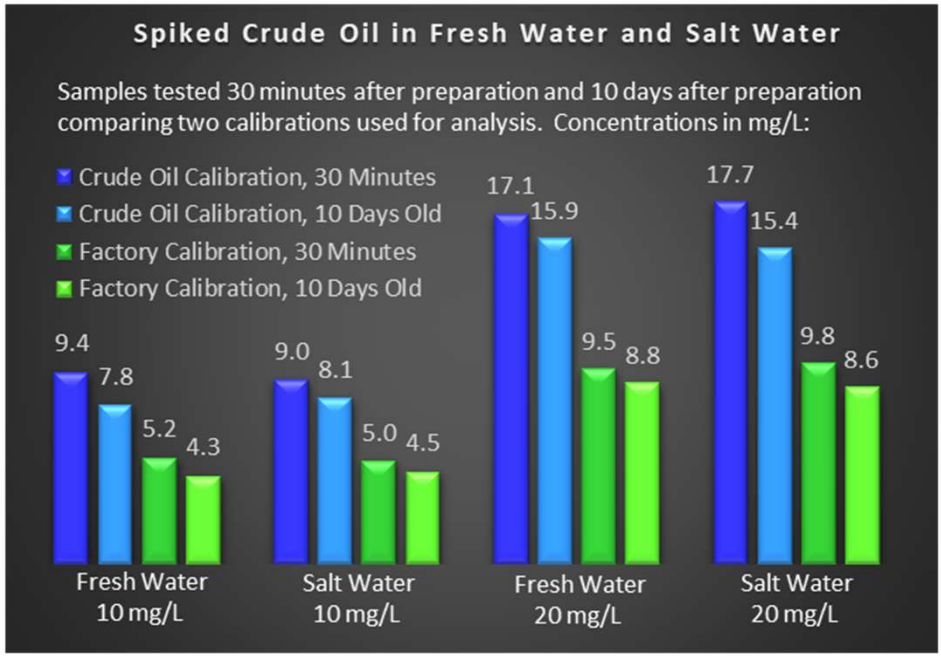
This study was performed to compare accuracy and precision testing oil in water samples using Sitelab's handheld UVF-500D hydrocarbon analyzer. Samples consisted of clean fresh water and salt water spiked with crude oil at two concentrations. Samples were prepared in duplicate and analyzed the same day and 10 days after preparation to check aqueous stability and degradation over time. Samples were extracted in hexane solvent using Sitelab's UVF-500D Water Test Kit for analysis. In addition, fresh water samples were also prepared and sent to a certified laboratory for Total Petroleum Hydrocarbon (TPH) analysis using EPA Methods 8015 and 1664 (Oil & Grease, HEM).

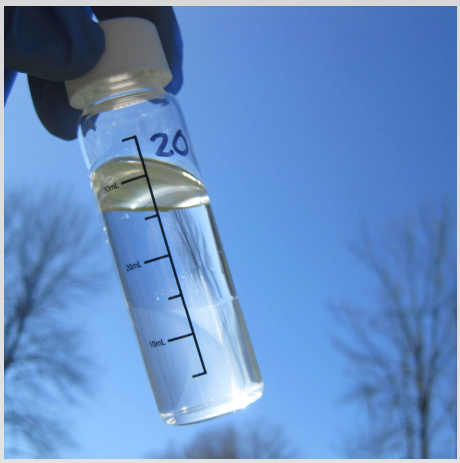
Samples Analyzed using National Institute of Standards & Technology (NIST), Standard Reference Material 2779, Gulf of Mexico Crude Oil

This product is very useful to validate UV fluorescence-based technologies. It contains a broad range of polycyclic aromatic hydrocarbons (PAHs) which can be detected using instruments fitted with a variety of UV light sources and optical filters. The UVF-500D is highly sensitive to this oil.

The oil was extracted in methanol for 24 hours at 10,000 ppm and used to prepare standards in hexane to calibrate the instrument. The extract was then used to spike the water samples. Certified Reference Materials (CRMs) available for fuels and other oils, including those typically used in proficiency studies, are always supplied in methanol for oil in water analysis. Methanol dissolves in water and the hydrocarbon content is fairly stable over time, as shown in Figure 1.

Figure 1





Samples are extracted in graduated 40 mL glass VOA vials using 15 mL of water with 15 mL solvent and then analyzed on the UVF-500D.

Water samples were also measured with Sitelab's TPH-Oil Calibration Kit, CAL-056H-500D supplied in hexane, used to factory calibrate the UVF-500D for comparison. Results exhibited are lower, in this case by 45%, due to the different composition of aromatic hydrocarbons in this product compared to the crude oil standard.

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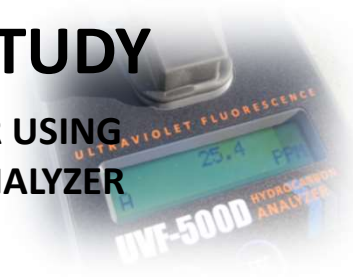
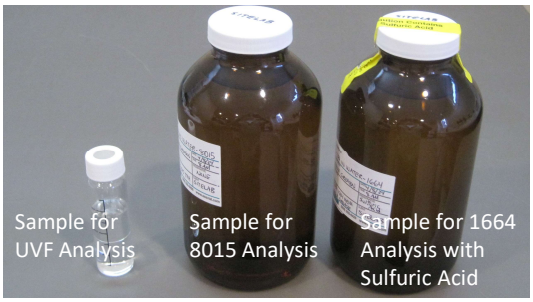


Spike Recovery Results vs. Certified Lab Results

Sample results in Table 1 compare two calibrations and Method 1664 to the oil in water spiked concentrations. Sample results in Table 2 compare two calibrations and Method 8015 to the spike value detected by the lab in the oil extract shown in Figure 2. In general, percent recoveries from 40% to 140% are considered accurate.

Table 1

Samples Spiked with Crude Oil Compared to EPA Method 1664		Test Result mg/L	Spike Conc. mg/L	Recovery %
Crude Oil Calibration 1, using 100 ppm Standard	Sample 1	9.4	10	94%
	Sample 2	17.1	20	86%
Sitelab TPH Calibration, using CAL-056H-500D	Sample 1	5.2	10	52%
	Sample 2	9.5	20	48%
vs. EPA TPH Method 1664, Oil & Grease by Gravimetric	Sample 1	ND <1.6	10	0%
	Sample 2	ND <5.0	20	0%



Samples were prepared in 1-Liter bottles, required by EPA Methods 8015 and 1664. This sample size is more wasteful, with higher disposal and material costs to consider.

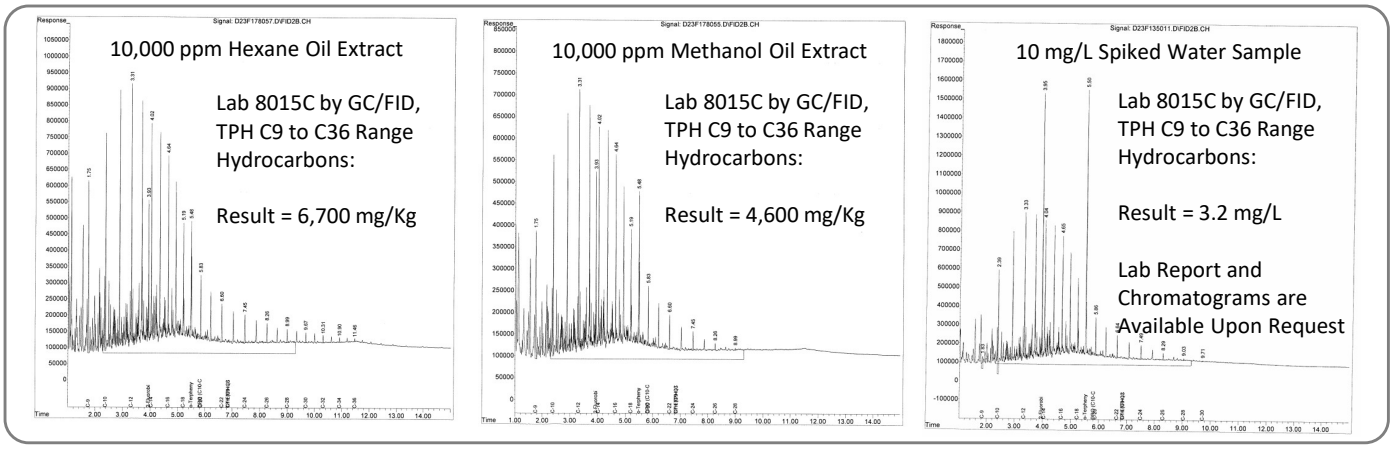
Oil was extracted in methanol and hexane solvent for 24 hours. Hexane dissolves all the oil into solution, including asphaltenes, methanol does not. These extracts were tested for TPH content in Figure 2 by the certified laboratory for comparison.

Table 2

Samples Spiked with Crude Oil Compared to EPA Method 8015		Test Result mg/L	Spike *Value mg/L	Recovery %
Crude Oil Calibration 2, using Standard at *46 ppm	Sample 1	4.4	4.6	96%
	Sample 2	8.0	9.2	87%
Sitelab TPH Calibration, using CAL-056H-500D	Sample 1	5.2	4.6	113%
	Sample 2	9.5	9.2	103%
vs. EPA TPH Method 8015, by Gas Chromatography	Sample 1	3.2	4.6	70%
	Sample 2	8.1	9.2	88%

*Calculated using laboratory's 4,600 ppm result reported in 10,000 ppm methanol extract

Figure 2



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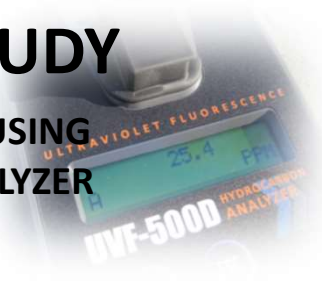
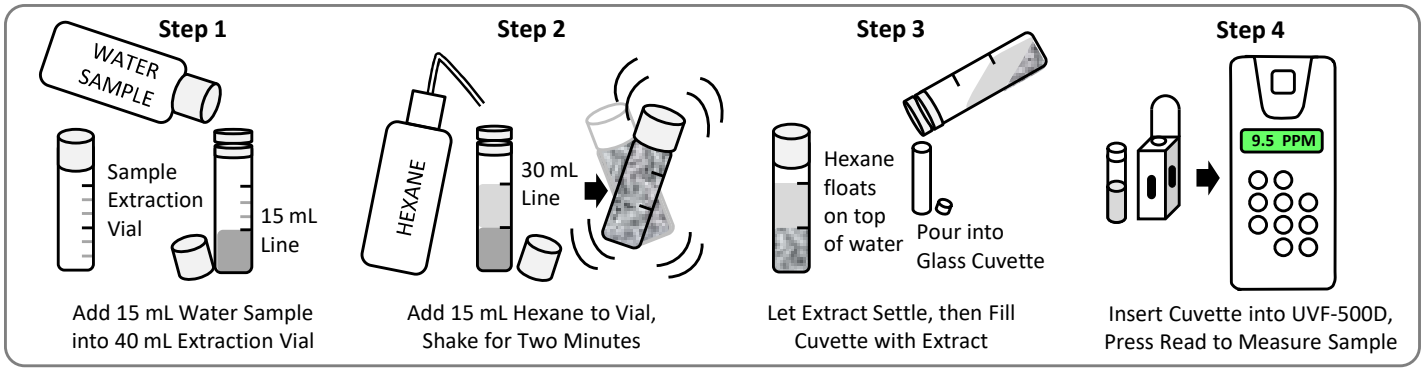


Test Procedure is Fast and Easy

Standard Operating Procedures (SOPs) developed by Sitelab Corporation for the UVF-500D provide fast, accurate and reliable data. Use on-site or in the lab. Samples only take a few minutes to analyze, as shown in Figure 3.

Figure 3



Summary and Conclusions

The UVF-500D performed well testing water samples with crude oil in this study. As expected, results in Table 1 were better using the crude oil to calibrate the instrument compared to the analyzer's factory calibration, but spike recoveries exhibited in Table 2 using Sitelab's TPH standard were close to the laboratory's results using EPA Method 8015 for confirmation analysis, which also performed well. Method 8015 is similar to ISO 9377-2 (OSPAR) or other GC methods used to detect hydrocarbons in the C10 to C40 carbon range.


UVF-500D is Sold Online
Photo by Obstitech ApS

Not surprisingly, the laboratory's results using EPA Method 1664 (Oil & Grease) performed poorly. No hydrocarbons were detected in the samples. This method also uses hexane and is often specified by regulators in the oil and gas industry to test oil in water samples in order to meet discharge limits. As demonstrated in this study, Method 1664 is not suitable for detecting this type of crude oil at low concentrations. The UVF-500D is a more accurate tool, proven here to be a better, alternative method for oil in water applications. Sitelab's CAL-056H-500D product is recommended to use by default if the source oil is unknown or not available to calibrate.

Products Used: For Details, Visit https://uvf-500d.com/

UVF-500D Analyzer
Part No. 50200

UVF-500D Water Test Kit
Part No. EXTR60-500D

NIST Standard Reference Material 2779 Gulf of Mexico Crude Oil:

Available at: https://shop.nist.gov/

- Five Ampules, 1.2 mL Each
- Safety Data Sheet
- Certificate of Analysis with PAH Composition

Source: Light Louisiana Sweet Crude with API Gravity 37.2° Collected from the Deepwater Horizon Oil Spill in 2010.