wilks
A Spectro Inc. Company

Different Technology Options for Monitoring Oil in Produced Water – Inline Continuous Monitoring and IR Analysis

No offshore facility wants to be caught with a sheen around their platform as that can result in a costly fine for exceeding discharge permit limits for oil. Onboard oil in water analyzers are necessary to ensure the oil/water separation systems are functioning properly before overboard disposal of the produced water. Bench top analyzers have traditionally been used to test oil in water although inline continuous monitoring systems are now on many platforms. While the inline system will give the operator valuable information about the waste stream along with an immediate alert if there is an upset, the bench top analyzers are necessary to validate if the alert is justified. While both infrared and UV fluorescence analyzers are commonly used for bench top testing, infrared has an advantage that will be explained below.

The two most prevalent technologies for continuous testing are UV fluorescence and particle analysis. With UV fluorescence, ultraviolet light excites the aromatic hydrocarbon molecules and the intensity of the emitted light is correlated to the concentration of oil. With particle analysis, video microscopes use images of particles and droplets with advanced algorithms to separate oil droplets from other particles for a quantitative oil measurement.

Each of the inline and offline technologies has their advantages and disadvantages. UV fluorescence is capable of measuring oil directly in water without any sample preparation. The disadvantage is that UV only measures the aromatic hydrocarbons. Produced water contains a mix of aromatic and aliphatic hydrocarbons. If the aromatic/aliphatic ratio changes, UV fluorescence will not give a correct reading unless the system is recalibrated. This could result in a spike of oil content in the produced water that is not detected by UV fluorescence and potentially over the permit limit.

Water is such a strong absorber of infrared light that the oil must be separated from the water for analysis, typically with a solvent. Infrared technology is, therefore, not well suited for inline analysis. However, unlike UV fluorescence, infrared measures the CH stretch frequency in all hydrocarbons including both the aromatic and aliphatic hydrocarbons. As a result, a component change in the waste stream will have little effect on the accuracy of the infrared measurement results. Therefore, coupling an inline UV fluorescence system with an offline infrared analyzer could give the platform operator an immediate alert with a backup infrared procedure for verification and daily testing.

Wilks Enterprise, Inc.
25 Van Zant Street, Suite 8F
East Norwalk, CT 06855 USA
www.WilksIR.com
info@wilksir.com · Tel 203-855-9136 · Fax 203-838-9868

For some water treatment systems such as hydrocyclones, the size and distribution of the oil droplets will greatly affect the performance of the oil/water separator. Inline particle analyzers give the needed size and distribution information for maximizing separator performance. When oil droplets are stuck together with other particles such as sand or algae, it is more difficult to categorize the portion of the particles that are oil droplets. While some sophisticated algorithms have been developed to overcome this issue, quantitative oil measurements with particle analyzers have a higher risk of inaccuracy than UV fluorescence or infrared technologies.

A challenge with inline systems is keeping the sample window clean. Without clean windows, neither UV fluorescence nor particle analysis will give accurate results. If the offshore operators fail to follow cleaning routines and keep seeing erroneous readings as a result, overall trust in the system goes down. It becomes a vicious cycle -- why make the effort on maintenance if the readings are invalid? Operator effort is essential for a properly functioning inline measurement system—another reason why grab sample testing on bench top oil in water analyzers are a necessary to verify oil levels in the treated wastewater.

While constant monitoring gives valuable trend data to help solve problems with oi separation systems, grab samples tested on bench top infrared instruments such as the Wilks InfraCal Oil in Water Analyzers are crucial for daily cross validation testing as well as determining if the inline system is functioning properly. For this reason, infrared analyzers are regularly used on offshore oil platforms to help guard against potentially-costly sheens.

InfraCal 2 Oil in Water Analyzer

Wilks – A Spectro Inc. Company
25 Van Zant Street, Suite 8F
East Norwalk, CT 06855 USA
www.WilksIR.com
info@wilksir.com · Tel 203-855-9136 · Fax 203-838-9868