Hydraulic Fracturing – Another Industry that Should be Measuring Oil in Water

Oil in water is a measurement that crosses many different industries—from municipal or industrial wastewater to produced water from offshore oil drilling platforms. Now "frac water" produced from hydraulic fracturing for natural gas extraction is entering the oil in water analysis arena.

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For both offshore produced water and onshore wastewater, regulations are typically the driving factor for oil content testing. The US is currently the only country commercially producing shale gas from hydraulic fracturing. As wide scale development in the US is relatively new, federal regulations specific to this industry are not yet in place. Regulations are currently state by state.

A number of countries across Europe, Latin America, Africa and the Asia-Pacific regions have natural gas resources that could eventually be released by hydraulic fracturing. The lack of development in some countries is due in part due to environmental concerns as seen with France's July 2011 decision to stop natural gas exploration. In the UK most of the focus seems to be on seismic activity. The concern is an earthquake could compromise the integrity of the cement well casing and allow for contamination of the surrounding area including drinking water. The beginnings of regulations in the UK are seen in the April 2012 report issued by the Department of Energy and Climate Change (DECC) recommending that fracturing could be allowed with safety provisions that mitigate seismic risks.

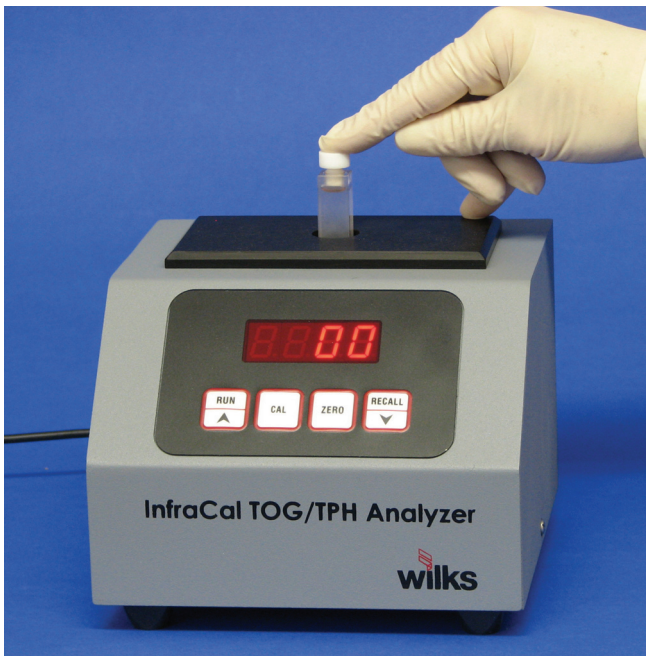
Without specific regulations, environmental testing then becomes economically or publically driven. With negative public attention focused on water—both the amount used in fracturing and the potential for contamination, it would be to the gas producer's advantage to monitor contamination and to reuse or reclaim water when possible.

Hydraulic fracturing requires a large amount of water. Some calculate as much as 5 million gallons of water is used per well. Most of the injected water for fracturing comes back to the surface within a few days as "flowback water". It is a mixture of fracture fluid and water from the shale formation containing solids, metals, salts, chemical additives and trace amounts of oil. Once the well is producing, a much smaller quantity continues to come to the surface as produced water.

Oil in water testing is often one of the first measurements needed for handling of flowback or produced water. On-site oil in water analysis can give results in minutes supplying gas well operators with valuable information for making adjustments to optimise wastewater treatment. Sending samples to an off-site lab can delay getting results for several days to several weeks.

Wastewater management options include evaporation ponds, removal to an off-site treatment facility, injection into disposal wells, and treatment for reuse in hydrofracking or for surface discharge. Each option has maximum levels of oil that will be accepted.

Evaporation ponds are sometimes employed for water disposal in arid areas. Oil on an evaporation pond will not only reduce the evaporation efficiency but is also a hazard for migratory birds attracted to the water.



Flowback water sent off-site to public treatment plants has to meet the oil and grease limits defined by what their system can handle. Injecting oily water into a disposal well will shorten the injection life of the well. For each of these disposal options, some type of oil separation system is usually needed to lower the oil level to meet the required limits. Oil in water testing verifies that those limits are met.

If flowback or produced water is going to be recycled and reused for hydrofracking or disposed of by surface discharge, typically the amount of total dissolved solids (TDS) will need to be reduced. The two most common methods to lower TDS levels are either membrane or thermal technologies.

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For TDS levels higher than a membrane system can handle (typically above 40,000 mg/L[1]), thermal evaporation and crystallisation systems may be the only option. Oil levels for a thermal system may also require monitoring as coarse solids and free oil are usually separated prior to evaporation.

Measuring oil in water is not new to offshore oil platform operators who have long faced strict discharge regulations. Infrared oil in water analysers, such as the Wilks InfraCal TOG/TPH Analyzer in photo 1, have been used for offshore produced water testing for more than 40 years

and are now being used more and more by industrial plants and municipalities. The same technology is ideal for testing the wastewater from hydraulic fracturing as the analysis does not require a skilled laboratory technician and can be done on-site in less than 15 minutes--reducing the cost and delay of laboratory analysis. If a spill, pond leak or well casing fracture occurs, infrared analysis can also be used to determine the extent of oil contamination or verify that groundwater has not been affected.

For gas producers, the cost for disposal is usually the driving factor for how wastewater is handled, while potential drinking water contamination is the primary concern in the public eyes. Other sectors of the petroleum and wastewater industry have long had regulations that set the parameters for wastewater treatment. As some bad press has already confronted hydraulic fracturing, operators would benefit from self regulation and on-site testing procedures to show environmental stewardship. On-site oil in water testing with infrared analysers is one simple procedure that will help operators exercise more diligence in monitoring discharges.

1 National Energy Technology Laboratory (NETL), Produced Water Management Technology Descriptions, Fact Sheet-Thermal Distillation, http://www.netl.doe.gov/technologies/pwmis/techdesc/thermal/index.html