APPLICATION NOTE

HIGH RANGE SULFIDE MEASUREMENT FOR OIL & GAS FIELD WATERS WITH HACH'S MODIFIED METHYLENE BLUE METHOD

Modified Methylene Blue Method Used to Measure High Range Sulfide in Oil and Gas Field Waters

Water demand is expected to increase as hydraulic fracturing continues to be applied in unconventional shale oil and gas development. The growing demand, economics, and environmental concerns has led to producers' utilization of non-traditional water sources and reuse water. Both approaches have led to increased concern over the impacts of hydrogen sulfide on well development and production. Hach has updated its method to allow this parameter to be easily and accurately measured in the field by non-technical operators.

OVERVIEW

Onshore oil and gas production from unconventional formations is expected to increase well into the future due to the efficiencies gained through horizontal drilling and hydraulic fracturing. This growth, coupled with the three to five million gallons of water required to hydraulically stimulate a single well is driving an ever-increasing demand for water. In order to meet these demands in an economical way without significant disruptions to the local community or environment, the industry is increasingly turning to reuse and/or otherwise unusable water, such as non-potable well water or water from industrial processes. Effectively using these waters to avoid potential complications requires a solid understanding of water quality throughout the entire process

IMPACT OF HYDROGEN SULFIDE ON HYDRAULIC FRACTURING WATER

Hydrogen Sulfide is an important parameter to track when making decisions related to source water selection and reuse. Well water in several regions of the country can be high in hydrogen sulfide, sometimes exceeding 60 mg/L (ppm). At high levels, this can lead to corrosion, odor, and safety issues, including death. Hydrogen Sulfide can also be produced by sulfate reducing bacteria that could be present in the source water or naturally occurring in the formation. Left unchecked, these high hydrogen sulfide levels could quickly sour a well leading to significant remediation cost or even closure of the well. In order to ensure a safe work environment, protect equipment, and avoid the other complications associated with this parameter, hydrogen sulfide levels in water should be kept close to zero and ideally less than 50 ug/L (ppb).

CHALLENGES WITH SULFIDE MEASUREMENT

Historically, hydrogen sulfide in traditional water samples has been measured using the Methylene Blue Method (USEPA Method 8131). Due to the volatility of this parameter, the sample should be measured

immediately to get an accurate result. Attempting to preserve samples for later analysis is not recommended and can lead to significant degradation in the result. This can pose a particular challenge for hydraulic fracturing applications given that the sampling locations are often remote. In addition, the range of this method is only 5 to 800 ug/L, which is inadequate for many of the waters encountered in hydraulic fracturing applications that can exceed 60 mg/L or more. Reaching these higher ranges requires dilution, which at times can be difficult to execute in the field.

SULFIDE MEASUREMENT IN THE FIELD

In order to get accurate results for this parameter, measurements should be conducted very close to the sample source, which often means on-site testing at the well pad. Hach has developed a modified version of the sulfide methylene blue method specifically for hydraulic fracturing applications that makes on-site testing easy. The method is written with step-by-step procedures making it easy for any operator to accurately perform the procedure and get accurate results regardless of their level of technical knowledge.

Furthermore, the range of the method has been extended to 70 mg/L to cover the wider ranges often encountered in this application. The new method simplifies analysis by making dilutions practically invisible to the end user. The operator simply selects low, medium, or high range using the colorimeter, and then adds the instructed amount of sample to the cell. The final result is automatically calculated and displayed by the colorimeter.

The new sulfide method can be programmed to run on Hach's DR/890 Portable Colorimeter (p/n 4847000). This is the same colorimeter included in Hach's Hydraulic Fracturing Water Analysis Kit (p/n 2994000). It allows for simple addition of the hydrogen sulfide parameter to existing equipment just by adding the appropriate reagents. The new method for the DR/890 can be found at hach.com/fracwater. A method has also been created for Hach's bench-top spectrophotometers for situations where a lab is in close proximity to the sampling location.

THE GOAL: ACCURATE SULFIDE MEASUREMENT MADE EASY

Avoiding possible complications due to the water used in hydraulic fracturing applications requires a strong understanding of the water quality in each step of the process. Hydrogen sulfide, in particular, must be carefully monitored to avoid serious safety, corrosion, and well souring issues that can cost involved parties millions of dollars in lost productivity and capital. Hach has made improvements to hydrogen sulfide measurement making it easy to perform by non-technical operators in the field.

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