Hydraulic Fracturing Fluid Analysis for Regulatory Parameters – A Progress Report

Presentation
Hydraulic Fracturing Fluid Analysis for Regulatory Parameters – A Progress Report

Kesavalu M. Bagawandoss, Ph.D., J.D.
Accutest Laboratories, Inc.

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Introduction

This presentation is a progress report on the analysis of Hydraulic Fracturing Fluids for regulatory compounds outlined in the various US EPA methodologies. Fracturing fluids vary significantly in consistency and viscosity prior to fracturing. Due to the nature of the fluids the analytical challenges will have to be addressed. This presentation also outlines the sampling issues associated with the collection of dissolved gas samples.

Discussion:

Hydraulic Fracturing Fluid Analysis:

Fracturing Fluids vary in consistency and viscosity. Methods employed for the analyses of the fracturing fluids include US EPA 500 and 600 series methods and Standard Methods for Water and Wastewater in combination with SW846 methods. Samples were analyzed for the constituents of the methods outlined in the table below.

Sample preservation consisted of those outlined in the appropriate methods. No issues were encountered upon preservation of the fluids.

Analytical challenges were encountered during analyses due to the matrices and the viscosity of the samples. The matrices and viscosity issues were alleviated by performing dilutions and utilization of smaller aliquots of samples.

Recoveries of surrogates and spikes were affected in the viscous samples. In some cases the surrogates were affected selectively depending on the fluid compositions. Surrogates and internal standards and its behavior in the matrix vary based on the samples. In some cases matrix spike compounds behave differently. For example in a VOA analysis the gases may recover fine yet the rest of the compounds may not recover at the same level as the gaseous components. In a semi volatile analysis the acid surrogates may not recover where as in the same sample the base surrogate recoveries may be adequately recovered.

The PQLs are affected when dilutions are performed due to the matrix interferences. Dilutions are generally performed to alleviate the viscosity issues or the interferences.

Dissolved Gas Sampling:

Sample collection for dissolved gases must be precise and consistent in order to determine the gaseous components present. This discussion focuses on sample collection using traditional techniques in comparison to samples collected in a pressurized piston sampling device as outlined in GPA method 2174-93. During a sampling episode based on samples were collected in Tedlar bags utilizing various techniques in the field. Samples were analyzed for dissolved gases. The data obtained from the analysis provided results which were inclusive for the components of interest. Subsequently, samples were collected after several attempts utilizing the pressurized piston sampling device, as outlined in GPA 2174-93. The analysis provided the gaseous components present in the sample and were quantified. Figure 1 depicts the device used to collect the samples. The samples captured were from a regular faucet.

Dissolved Gas Sampling (continued)

The sampling device can be utilized to collect samples at the wellhead to determine gaseous components in the flow back water after the fracture job is complete to account for emissions. Collection of samples using the pressurized piston sampling device allows the samples to be maintained in the same as it exists in the well environment.

Conclusion:

Viscous fracturing fluids required dilutions due to the matrix. Quality control limits were achieved for non viscous samples. Sample aliquot reduction in some cases without matrix interferences yielded adequate recoveries. Even though smaller aliquots were used in the extraction process dilutions were still required to suppress matrix interferences.

Utilization of the pressurized piston sampling device provided meaningful data and detection of gaseous components. The concentration of the gaseous component was measurable whereas samples collected in Tedlar bags did not yield any meaningful data. This device can be used to collect samples at the well head and maintain the integrity of the sample. The data obtained would be reflective of the sample.

Tables:

Methods

- **Acrylamide – SW846 – 8316**
- **Metals – Method 200.8 / 245.1**
- **Cyanide/ Weak and dissociable, Total – SM 4500 CN E & I**
- **Fecal and Total Coliform – SM 9222D & B**
- **Total Phenolics – EPA Method 420.4**
- **Herbicides – SW846 – 8151**
- **Ion Chromatography – EPA Method 300**
- **Residual Chlorine – SM 4500 CL G**
- **VOA's – EPA Method 624**
- **SVOA's – EPA Method 625**
- **Pesticides/ PCB's – EPA Method 608**
- **2,3,7,8 – TCDD – EPA Method 1613B**
- **Halo Acetic Acids – EPA Method 552.3**
- **1, 2 – Dibromoethane – SW846 - 8011**

References:

1. **Gas Processors Association Method 2174-93.**
2. **US EPA SW846 Methods: http://www.epa.gov/epawaste/hazard/testmethods/sw846/online/index.htm**
3. **Standard Methods for the Analysis of Water and Waste Water.**
4. **US EPA Methods for Water and Wastewater Analysis.**

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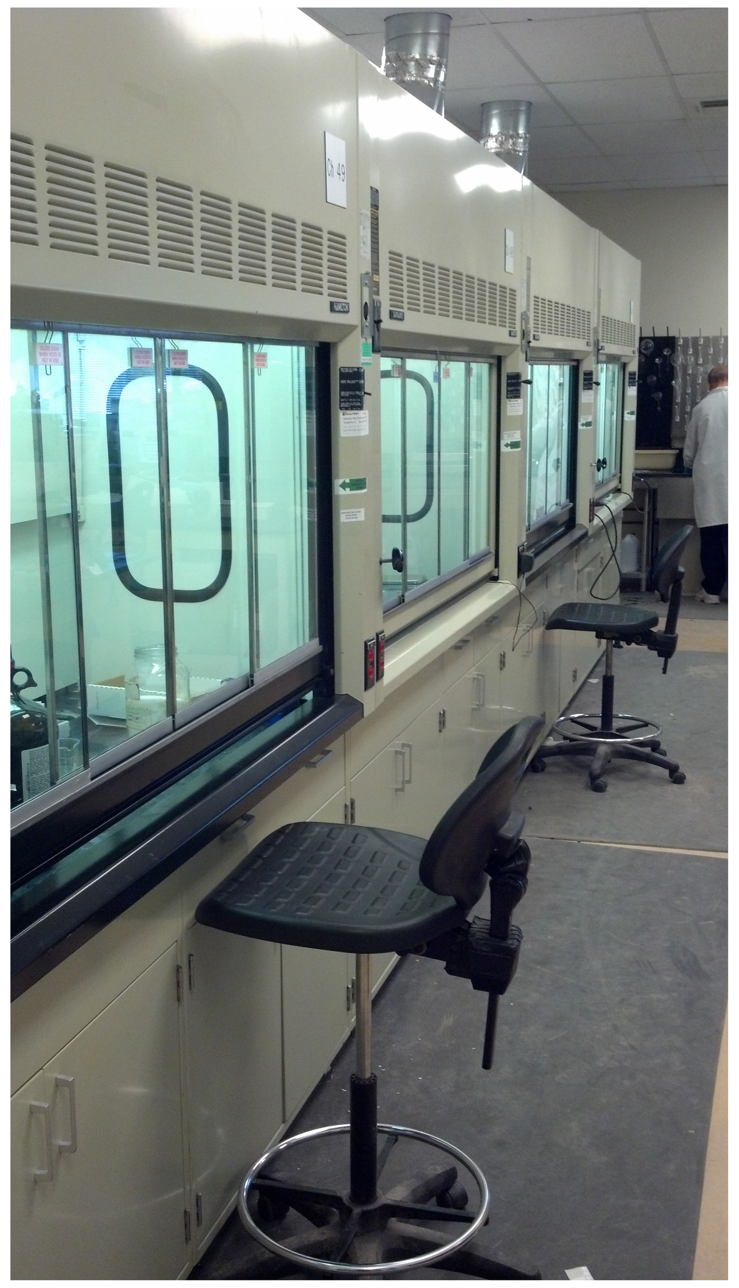

GPA 2174-93

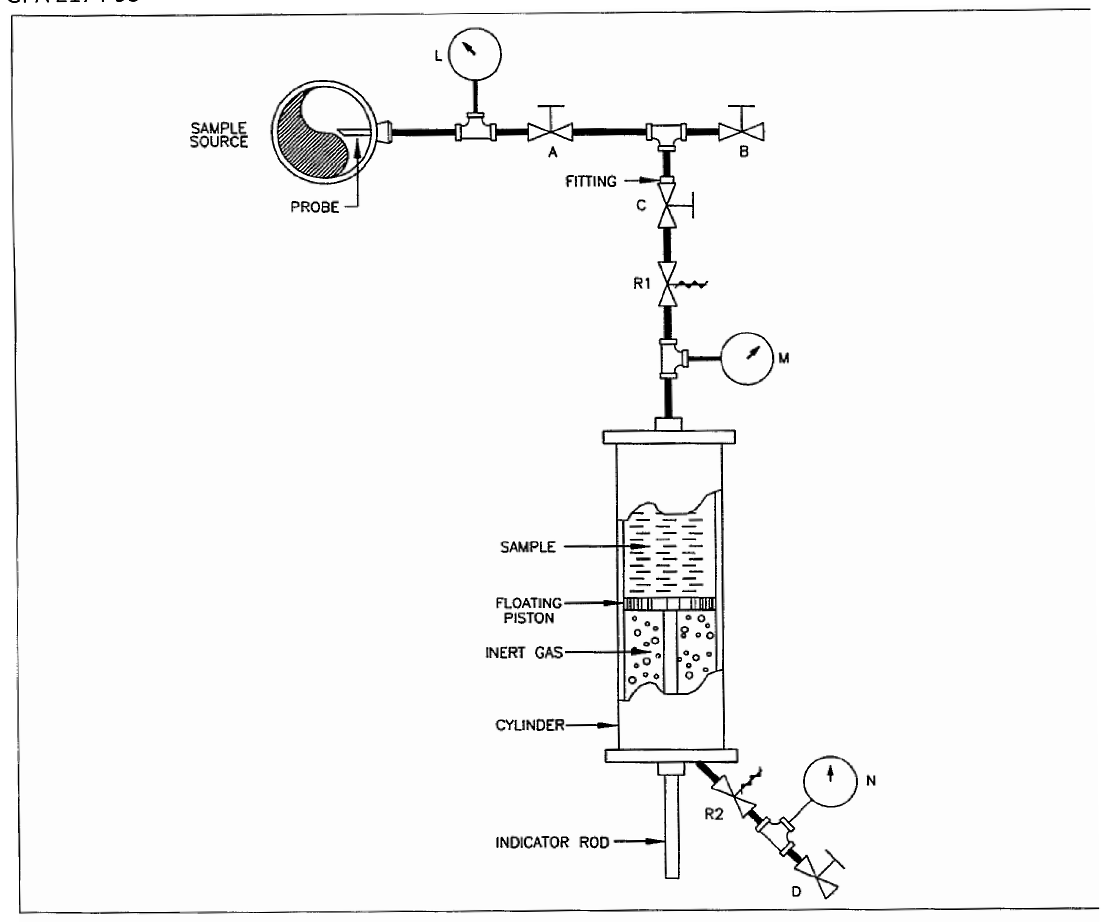

Figure 1. Typical Visual Indicator Sampling System