Produced Water Jar Testing

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Agenda

Focus on Hydraulic Fracturing Flowback

Constituents of Concern

Chemical Treatment and Options

Video
Current Status of the Permian Basin

3M BOPD are produced
6,000 produced water pits
10,000 SWDs, which are strained
Massive volumes of produced and flowback water are bottlenecks operations
Frac Flowback

- Highly variable in nature
- Slick versus gel fracs require different reuse quality
- Flowback can have high levels of friction reducers, resulting in viscous homogenous qualities
- Oil droplets and oily solids – size matters
Complex & Varying Inlet Water Quality

Frac Fluid

Flowback and Early Production Water

Produced Water
Constituents of Concern

- Oil in Water
- Total Suspended Solids
- $\text{H}_2\text{S}$
- Bacteria
- Iron
Chemical Treatment Options

• Equipment Decisions
  • Floc and Drop
  • Floc and Float

• Chemistry
  • Oxidant
  • Coagulant
  • Flocculant
Jar Test Method

- Develop Test Protocol and review HSE handling procedures for given produced water, considering H₂S potential
- During raw water collection, measure the samples for conductivity, pH, iron, temperature, ORP and turbidity.
- Measure 1L samples of raw water into each jar.
- Insert the mixing blades and start the mixer at 50% speed.
- Add the oxidant in equal doses until the desired level of oxidant had been dosed to all jars.
- Allow the mixers to run for approximately 20 seconds.
- Add the Coagulant until the desired doses had been added to each jar.
- Allow the mixers to run for approximately 30 seconds.
- Turn the mixer to 65% speed, add the Flocculant to each jar until the desired dose had been provided and then stop the mixers.
- Allow each jar to settle for exactly 20 minutes.
- Collect samples of the settled water from approximately 1” below the surface using pipettes.
- Analyze each sample for turbidity.
- Collect and analyze new samples for iron content and oil-in-water measurements.
- During each test, pipette tips were assigned to each chemical dilution to prevent sample contamination.
Chemical Matrix

Pre-Treatment

- **Type**
  - Oxidant: NaOCl, ClO₂, H₂O₂
  - Coagulant: PACI
  - Flocculant: Polymers

- **Purpose**
  - Iron & H₂S oxidation
  - Aggregate particulates & droplets
  - Grow Floc

Post

- **Type**
  - Biocide: Oxidant, Glut,

- **Purpose**
  - Control Bacteria Growth
After Settling
Contact Information

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