AQUA PURE
TECHNOLOGIES

Recycled Brine Drilling Mud , Northern Alberta

Client Overview

The client, an oil and gas company operating in Northern Alberta, faced challenges during its drilling program, including managing large volumes of brine used as the formation drilling fluid. To improve the efficiency of the operation and reduce environmental impact, the client sought an innovative solution for recycling and reusing brine to minimize waste and reduce costs.

Project Objectives

The primary goals for the brine recycling project were:

1. **Removal of suspended solids**
2. **Removal of colloidal solids**
3. **Removal of residual polymers**
4. **Reduction of total fluid volume**
5. **Eliminate the need for purchasing fresh brine**
6. **Remove the need for disposal of old brine**

Background

The client successfully executed half of the drilling season by recycling a 1300kg/m^3 $CaCl_2$ brine solution as the formation drilling fluid. The brine was subjected to a mud management program that included flocculation and centrifugation to remove residual solids. However, over time, residual solids that were not removed during primary separation accumulated in the drilling fluids, leading to colloidal solids buildup. By the end of the program, colloidal solids made up approximately 23% by mass and up to 85% by volume of the total drilling fluids.

Prior to the Aqua Pure Technologies' treatment, this buildup created significant challenges, impacting the efficiency of the drilling process and resulting in higher disposal costs and the need to purchase additional brine for the ongoing drilling operations.

Solution Implementation

Aqua Pure Technologies, in collaboration with PURE Environmental Solutions, implemented a three-stage separation system designed to efficiently remove suspended solids, colloidal solids, and residual polymers used in the prior treatments. The process utilized existing equipment on-site, including a drilling mud mixing tank, which blended combinations of recycled brine and fresh water.

The treatment process involved several key steps

- **Coagulation/Flocculation: Aqua Pure's AP1454 coagulation and flocculation chemistry was applied at optimized ratios to facilitate the removal of suspended and colloidal solids.**
- **Primary Solids Separation: The fluid mixture was passed through the PURE Environmental Solutions Diffuser system, where suspended solids were separated. Settled solids were collected from the bottom, and floating solids were skimmed from the top of the system.**
- **Centrifugation: The settled solids were further processed using a centrifuge, separating remaining solids for disposal.**
- **Polishing: The residual brine was polished using Aqua Pure's advanced ultra-filtration process to remove any remaining impurities and ensure the brine met the necessary specifications for reuse.**

Challenges

The project faced significant environmental and operational challenges, including: Extremely cold temperatures: The project took place during the coldest weather snap in Northern Alberta in 20 years, with temperatures exceeding -35°C standing and -45°C wind chill. Despite these extreme conditions, the brine treatment process was successfully executed.

AQUA PURE
TECHNOLOGIES

Results & Analysis

By the end of the process, all the brine was successfully recycled and returned to the client, enabling them to complete their drilling program without the need for additional brine purchases or disposal of used brine. This solution resulted in the following measurable outcomes:

Disposal of Drill Mud: 90% reduction in disposal costs.

Blending of Replacement Brine: 95% reduction in costs associated with blending new brine.

Haulage Savings: 85% reduction in hauling costs.

CO2 and GHG Emissions: 85% reduction in greenhouse gas emissions from the drilling operation.

Additionally, the brine was successfully recycled, returning to the client with an optimal concentration of 1300kg/m^3 $CaCl_2$, meeting the required quality standards for further use.

Volume and Performance Data

Volume of Brine for Treatment 105m^3

$CaCl_2$ Content 28.5 wt%

Solids Content by Volume 10-85%

Solids Density1200-2700 kg/m^3

Viscosity 25 cP @ -20°C

pH Not specified

AQUA PURE
TECHNOLOGIES

Intermediate Process Data (Post-Primary Solids Separation)

Volume Treated 105m^3

Treated Water Added 31.5m^3

Solids Removed (Estimated) 32m^3

Chlorides Content 28.5 wt%

Solids Content by Volume 10-85%

Fully Processed and Recycled Brine Data

Volume Treated 104.5m^3

Waste Removed 13.1m^3

Chlorides Content 28.5 wt%

Solids Content by Volume 4%

Volume of Cleaned Brine 91.4m^3

Calcium Chloride Added 17,099 kg

Environmental and Economic Benefits

Significant Reduction in Waste and Emissions: The brine recycling process led to an 85% reduction in CO_2 emissions and overall greenhouse gases (GHGs).

Cost Savings

The client achieved notable savings across various operational areas, including disposal, hauling, and the purchase of new brine.

Conclusion

The brine recycling project in Northern Alberta successfully met the client's objectives, providing an effective and sustainable solution that reduced environmental impact while achieving substantial cost savings. The implementation of Aqua Pure's innovative treatment process, in partnership with PURE Environmental Solutions, enabled the client to continue their drilling operations without the need for additional brine procurement or costly disposal, demonstrating a clear commitment to sustainability and operational efficiency.