M-I SWACO
A Schlumberger Company

RHE-USE System Economically Reduces Ultrafine, Colloidal LGS Content from Oil-Base Drilling Fluids

Improved mud properties help achieve higher drilling efficiency and optimized performance in the Haynesville Shale, East Texas

CHALLENGE

Reduce performance-limiting drilling solids, especially ultrafine, colloidal low-gravity solids (LGS).

SOLUTION

Use the RHE-USE* two-stage centrifuge system to economically remove LGS from oil-base drilling fluid.

RESULTS

- Significantly reduced LGS content in 2,900 bbl [458 m^3] of highly contaminated drilling fluids.
- Adjusted oil/water ratio and other mud properties during processing, enabling the reuse of clean mud for drilling.
- Achieved operator's LGS percentage goal, saving dilution and disposal costs.

The RHE-USE system lowered average LGS percentage from 11% to 5%.

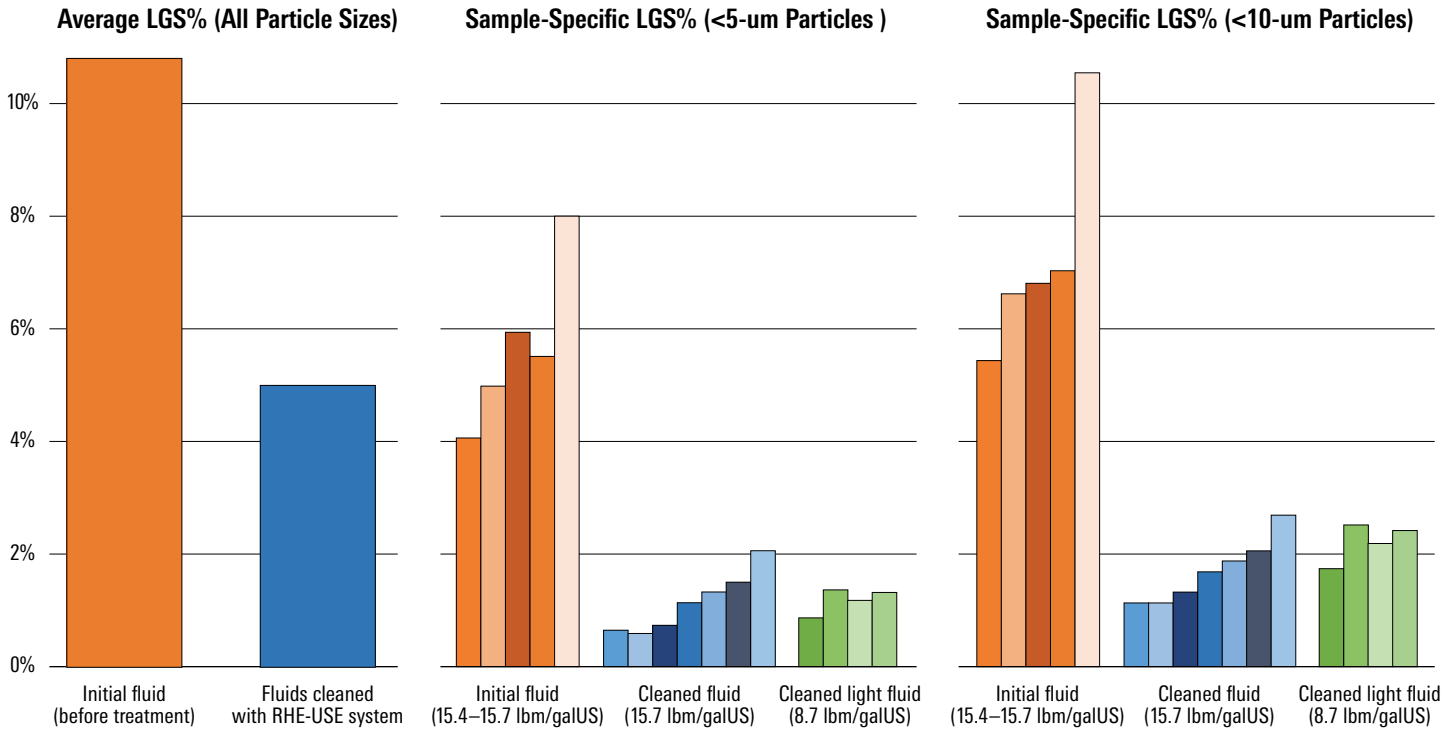
Efficient solution required to reduce accumulation of solids in drilling fluid system

An operator was using solids-contaminated oil-base drilling fluid on multiple wells and rigs in the Haynesville Shale of East Texas. Particle-size distribution analysis and mud checks showed that the drilling fluids were highly contaminated with LGS, and ultrafine colloidal solids smaller than 10 um represented 70% of the total solids. These drilling solids, which have detrimental effect on all drilling systems, had been tolerated at a much higher concentration than is efficient for maximum drilling performance. Often, the operator applied dilution, disposal, and rebuild methods, which involve adding large amounts of diesel and lighter weight drilling fluid to mitigate the effects of undesired solids. However, these methods increase total costs and offer no long-term solution for the accumulation of drilled solids in the drilling fluid system. The operator sought a more efficient and economical method to eliminate LGS from drilling fluids on a Haynesville Shale well.

RHE-USE system significantly reduces LGS content in highly contaminated drilling fluids

M-I SWACO recommended deploying the RHE-USE two-stage centrifuge system, which combines staged centrifugation and chemically enhanced treatment to render LGS and drill solids manageable. This patented system recovers barite as well as flocculates and removes ultrafine solids, producing a drier cuttings discard. As a result, solids are reduced to below 1% while drilling, enabling operators to reuse invert-emulsion drilling fluid over multiple wells. Complementing the advanced solids control technologies, the RHE-USE system also includes a mixing system as well as fluid and bulk storage tanks.

By reducing the amount of LGS in the fluid, the RHE-USE system saves on resources, such as barite, base fluids, and chemicals associated with building invert-emulsion drilling fluids.



Particle-size distribution analysis demonstrated that the RHE-USE system helped decrease ultrafine particles (<10 um and < 5 um) compared with the initial mud. Columns represent individual samples taken during drilling.

Improved mud properties achieve greater drilling efficiency

By adjusting the oil/water ratio and other mud properties during processing, clean mud with lower volume was obtained and made ready for drilling with minor reconditioning.

Input Volume, bbl [m^3]	Input LGS Content, %	Output Volume, bbl [m^3]	Output Mud Weight, lbm/galUS [kg/m^3]	Output LGS Content, %
2,900 [461]	10–16	1,790 [285]	15.7 [1,868]	4–5
		1,110 [177]	8.7 [1,042]	6

Particle-size distribution analysis was performed on the samples collected through the processing. Data showed that the RHE-USE system lowered the overall LGS content and removed ultrafine, colloidal particles with high efficiency, which could not have been achieved using conventional solids control methods.

Achieving its LGS goal while treating the 2,900 bbl of fluids enabled the operator to save on mud costs and transportation compared with conventional dilution and disposal. With an adequate volume of clean, high-quality mud for displacement, optimal drilling efficiency and drilling performance were achieved.

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