Case History

Advanced Dewatering and Waste Management Optimization in a Geothermal Project, Germany

Newpark's integrated flocculation and centrifuge system significantly reduced liquid waste volumes and enabled direct reuse of recovered water in an environmentally sensitive operating area.

CHALLENGE	SOLUTION	RESULT
• Sensitive environmental area • No liquid disposal allowed • Need to minimize waste volumes due to limited corral capacity • Risk of flocculant carryover	• Inhibitive water-based mud system • Automated flocculation unit • Integrated high-speed centrifuge • Engineered flocculants • Reuse of processed overflow • Continuous optimization	• Reduced waste disposal volumes • Logistics – significantly less truck movements required • Lower environmental impact • Less freshwater consumption • Stable mud properties

OVERVIEW

A geothermal drilling campaign in Germany involved drilling two adjacent wells using bentonitic spud mud in the surface section and inhibitive water-based mud (WBM) systems based on KCl-polymer chemistry in the intermediate and reservoir sections. Because the site location was an environmentally sensitive area with strict operational constraints, the operator required a waste management solution that could reduce liquid waste volumes, while maintaining drilling fluid performance and operational efficiency.

Newpark provided a fully integrated dewatering solution, combining automated flocculation with high-speed centrifuge treatment. Unlike conventional waste management operations, where recovered water is stored for additional treatment or disposal, this project required direct reintroduction of centrifuge overflow into the active circulation system as dilution water. This approach reduced freshwater consumption and minimized waste transportation requirements.

NEWPARK FLUIDS SYSTEMS

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Figure 1: Drilling Site Location (Green area close to the village center)

CHALLENGE

The drilling operation presented several technical and environmental challenges. The drilling fluid used during the campaign was an inhibitive water-based system with densities up to 1.25 sg, incorporating KCl, polymers and shale encapsulator for drilling performance, plus sulfonated asphalt for wellbore stabilization and management of low gravity solids (LGS). Effective removal of these ultrafine solids was critical to maintaining stable rheological properties and minimizing dilution requirements.

The principal challenge was the direct reuse of centrifuge overflow in the active mud system. Incorrect flocculant selection or improper setup of the flocculation unit could lead to excessive flocculant carryover, potentially contaminating the active drilling fluid and negatively affecting drilling performance.

Additional objectives included:

- ✓ Maintaining mud weight below 1.17 sg
- ✓ Optimizing solids control efficiency during all drilling phases
- ✓ Minimizing liquid waste disposal volumes,
- ✓ Lowering waste transportation frequency,
- ✓ Reducing environmental impact and carbon footprint

SOLUTION

Newpark deployed an automated flocculation unit integrated with a high-speed centrifuge system across both wells. The flocculation process enhanced aggregation of ultrafine solids, significantly improving centrifuge separation efficiency and overflow quality.

Specially engineered anionic and cationic flocculants were selected and optimized according to drilling phase and drilling fluid composition. During the 24” section of the first well, drilled with bentonitic spud mud, both anionic and cationic polymer flocculants were evaluated under field conditions before final optimization. A cationic flocculant was then predominantly selected for the later phases of the first well and for the second well.

Recovered overflow fluid after centrifugation maintained a maximum density of approximately 1.03 sg due to dissolved KCl in the water phase. This processed water was continuously reintroduced into the active mud system for dilution, eliminating the need for additional disposal or treatment.

Operational optimization focused on:

- ✓ Flocculant concentration control and optimization of dosing rate
- ✓ Centrifuge differential speed optimization
- ✓ Minimization of flocculant carryover
- ✓ Continuous low-gravity solids reduction
- ✓ Improved solids discharge dryness

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Hole Section	Interval (m-m)	Mud Type	Processed Mud (m^3)	Flocculant Type	Average Flocculant Concentration (kg/m^3) in the Flocculant Solution
24”	0-528	Spud Mud	240	Dry Anionic/Cationic polymer	1.25
17 ½”	528-1405	KCl-Poly	686	Dry Cationic Polymer	1.13
12 ¼”	1405-2585	KCl-Poly	750	Dry Cationic Polymer	0.80
8 ½”	2585-3655	KCl-Poly	314	Dry Cationic Polymer	1.03
Total			**1990**	**-**	**-**

Table 1: Results-First Well

Hole Section	Interval (m-m)	Mud Type	Processed Mud (m^3)	Flocculant Type	Average Flocculant Concentration (kg/m^3) in the Flocculant Solution
24”	0-520	Spud Mud	290	Dry Cationic Polymer	1.46
17 ½”	520-1405	KCl-Poly	772	Dry Cationic Polymer	1.52
12 ¼”	1405-2585	KCl-Poly	1219	Dry Cationic Polymer	1.03
8 ½”	2585-3857	KCl-Poly	580	Dry Cationic Polymer	0.47
Total			**2861**	**-**	**-**

Table 2: Results-Second Well

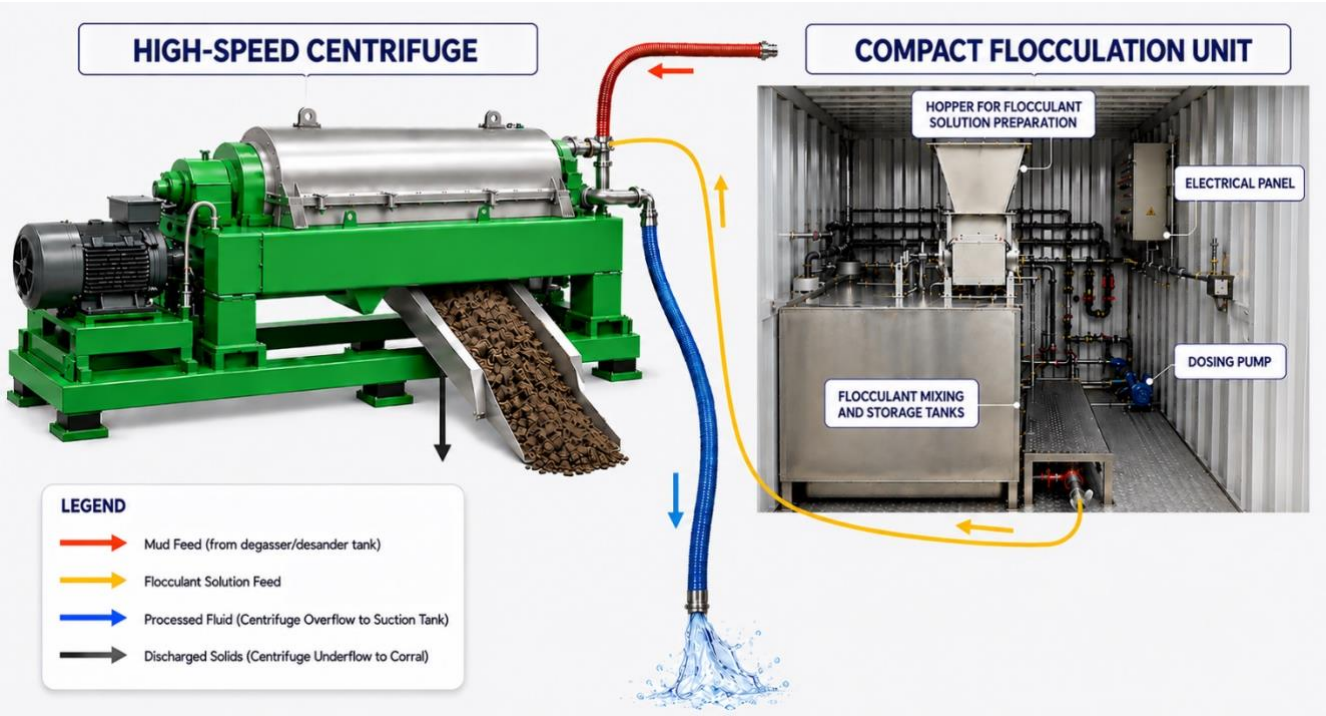

Figure 2: Integrated Dewatering System

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RESULTS

The integrated dewatering and flocculation solution delivered strong operational and environmental performance throughout the geothermal campaign. The automated system improved fine-solids separation efficiency, enabling continuous reduction of low-gravity solids while maintaining stable mud properties and mud weight below 1.17 sg. Recovered water was successfully reused in the active system without evidence of excessive flocculant carryover.

Key operational and environmental benefits included:

- ✓ Significant reduction in liquid waste disposal volumes
- ✓ Reduced freshwater consumption through reuse of processed water
- ✓ Lower waste transportation frequency and associated costs
- ✓ Reduced carbon footprint and environmental impact
- ✓ Improved centrifuge solids discharge performance
- ✓ Enhanced drilling fluid stability and solids control efficiency

This project demonstrated that advanced flocculation and centrifuge technologies can support geothermal drilling operations in environmentally sensitive areas by reducing waste volumes, lowering freshwater demand, and improving overall waste management efficiency.