

# Operator Drills Highly Deviated Well to Record Depth with Integrated RDF System, North Slope

Combination of fluids maintains high-quality rheology within system pressure parameters and achieves excellent hole cleaning, Alaska

## CHALLENGE

Obtain lower system pressures without compromising hole cleaning ability.

## SOLUTION

Use POWERPRO CT\* coiled tubing debris-removal fluid in combination with POWERVIS\* linear biopolymer viscosifier.

## RESULTS

Drilled the highly deviated well to record depth while maintaining good fluid rheology within system pressure parameters.



## More efficient drill-in fluid needed for minimizing shale instability

An operator's coiled tubing (CT) drilling plan called for a high-angle extended-reach sidetrack to access a new section of an oil reservoir located a considerable distance from the wellhead. A 4½-in [10.5-cm] openhole section was to be drilled to TD and completed with a slotted liner topped with a billet to kick off the second lateral. Earlier extended-reach wells in the area experienced high ECD and 4,000-psi [27.6-MPa] pressure losses—both of which required lower-rheology fluid systems to stay within pressure parameters and compromised hole cleaning ability.

## POWERPRO CT fluid with POWERVIS viscosifier lowers free-spin pressures and ECD

Previous extended-reach CT drilling operations in the area used the FLO-PRO SF solids-free water-base reservoir drill-in fluid system containing a xanthan gum biopolymer as the system viscosifier. Based on modeling predictions using the VIRTUAL HYDRAULICS\* drilling fluid simulation software, the xanthan biopolymer was found to be unacceptable because of the high system pressures that occur in extended-reach wells and the extra viscosity needed for hole cleaning purposes. In response to the operator's requirements for the highly deviated well, M-I SWACO recommended using the POWERPRO CT fluid to minimize shale instability issues, which are typical in this area, in combination with POWERVIS viscosifier. Field tests have proved that using the POWERVIS viscosifier in low-salinity fluids produces higher low-shear-rate viscosities and lower plastic viscosities at equal or lower concentrations than xanthan gum.

## Combination maintains high-quality fluid rheology within pressure constraints

The POWERPRO CT fluid and POWERVIS viscosifier enabled drilling the well to record depth while maintaining good fluid rheology within system pressure parameters. The quality fluid rheology achieved enhanced hole cleaning in this highly deviated well, which reached 80° inclination 17,000 ft [5,182 m] before the kickoff point in the main well and greater than 95° in the open hole. A clean, stable open hole was drilled in both laterals. The rheological parameters that the xanthan biopolymer would have provided would not have been sufficient for the high-pressure conditions and would have prevented a successful CT drilling operation.

	Xanthan Gum			POWERVIS Viscosifier					
				650-psi Difference			String Agitator Used		
	Initial	Final	Change	Initial	Final	Change	Initial	Final	Change
System pressure loss (free spin), psi [MPa]	3,000 [20.9]	3,450 [23.8]	450 [2.9]	2,350 [16.2]	3,000 [20.9]	650 [4.7]	2,800 [19.3]	3,100 [21.4]	300 [2.1]
ECD, lbm/galUS [g/cm <sup>3</sup> ]	10.5 [1.26]	11.3 [1.35]	0.8 [0.09]	9.7 [1.16]	10.7 [1.28]	1.0 [0.12]	10.0 [1.20]	10.4 [1.25]	0.4 [0.05]
	<b>120-lbm [54-kg] Polymer Added</b>			<b>75-lbm [34-kg] Polymer Added</b>			<b>No Polymer Added</b>		
Plastic viscosity, cP [Pa.s]	7–8 [0.007–0.008]			4 [0.004]			4 [0.004]		
Yield point, lbf/100 ft <sup>2</sup> [Pa]	21–24 [10.08–11.52]			14–18 [6.72–8.64]			16 [7.68]		
Low-shear-rate viscosity, cP [Pa.s]	28,000–30,000 [28–30]			31,000–34,000 [31–34]			33,000–37,000 [33–37]		

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