CASE STUDY

Saudi Arabia: KLA SHIELD/POROSEAL tandem records zero NPT in troublesome well, exceeds operator objectives.

"The hole condition throughout this interval has been excellent, and I attribute this success primarily to the mud system. We've experienced none of the programmed potential hole problems that were seen on some of the offset wells. The overall maintenance of this mud system has been surprisingly minimal as it remained very stable throughout."

Mohammad Youssef, M-I SWACO Technical Services Engineer

Well Information

Location ..... RUB' AL KHALI, Kingdom of Saudi Arabia

Spud ..... May, 2011

Hole Size ..... 12 in.

Interval Length ..... 3,814 ft (1,160 m) from 7,290 ft – 11,104 ft (2,223 m – 3,385 m)

Maximum Bottom Hole Temperature ..... 294° F (146° C) at 11,104 ft (3,385 m)

Mud Density ..... 74-77 lb/ft^3 (10.0 to 10.3 lb/gal)

The Situation

Historically, the operator employed a standard KCl/polymer/asphalt mud system to drill the 12 in. hole section. High densities were required to stabilize troublesome zones such as the Khafji and Ahmadi shales. Further, offset wells experienced limited success when drilling depleted argillaceous limestone/sand formations with numerous problems, including sloughing shale, packing off, extreme over pull, hard back reaming, stuck pipe, and in some instances, bit and stabilizer accretion. The operator was looking for a more robust fluid capable of accommodating an extensive evaluation program, without resorting to an oil or synthetic-based mud with the accompanying logistic and environmental concerns. For this interval, the operator wanted to cut five cores across a series of formations to complete the earlier geological studies that were hindered with shale-related wellbore problems. One of the offset wells, which used a KCl/polymer drilling fluid, encountered 30 days of downtime, forcing the operator to plug back and displace with an oil-based mud to finish the well.

The Solution

M-I SWACO proposed its KLA-SHIELD* high performance water-based drilling fluid employing KLA-STOP* as the primary inhibitor, as well as the new POROSEAL sealant. This aqueous-based system is designed to provide shale stabilization and reduce the swelling of sensitive shales and drill cuttings exposed to water-based drilling fluids. Previous laboratory studies with regional shales indicated that the total system package displayed better performance with regards to shale recovery, bulk hardness and accretion. These laboratory results had been validated with outstanding field performance in other troublesome shales within Saudi Arabia. The key components of the proposed KLA-SHIELD system was KLA-STOP shale hydration suppressant, IDCAP D encapsulator/dispersion inhibitor, DRILZONE anti-accrete and ROP enhancer and POROSEAL sealant additive.

The Results

The KLA-SHIELD / POROSEAL system exceeded the client's requirements with no fluid-related downtime and successful execution of five coring runs. The operator was impressed with the performance and plans to use the system in future wells.

The Details

KLA-SHIELD / POROSEAL system properties while drilling the 12 in. section

Properties	Unit	Planned	Achieved	
			Min	Max
Density	lb/ft^3	74-90	74	77
Plastic Viscosity	cP	ALAP	14	18
Yield Point	lb/100 ft^2	20-30	21	38
6 RPM		12-14	6	15
Yield Stress	lb/100 ft^2		4	11
API Fluid Loss	cc/30 min	<6	1.8	3.2
pH		8.5-9.5	9	9.8
MBT ppb	lb/bbl	0-10	0	7.5
Drill Solids	%	<6	0	2.7
KLA-STOP	% v/v	2-3	2.3	3.1
IDCAP* D	lb/bbl	2-3	2.4	3.2
POROSEAL	% v/v	2-3	2.8	3.1
DRILZONE*	%v/v	2-3	2.3	3.1

Summary

- No non-productive time (NPT) associated with the drilling fluid
- Drilling fluid properties maintained easily within programmed ranges
- No accretion or BHA balling issues
- No stuck pipe incidents associated with wellbore collapse
- No loss circulation issues
- Successful execution of five coring runs
- Electrical logging program (average hole size 12.4 in.) completed successfully
- Multi-day MDT logging program conducted effectively
- Casing run and cemented with no issues even after 42 days of wellbore exposure to the KLA-SHIELD system

Questions? We'll be glad to answer them.

If you'd like to know more about the KLA-SHIELD / POROSEAL and how it's performing for our other customers, please call the M-I SWACO office nearest you.

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