



# Operational Expertise and Utilizing Avaperm NF™, Avagreen Lube™ and Avatex™ Fluids Technologies, Results in Significant Time and Cost Savings for Operator, Onshore Oman

The operator chose Newpark after remarkable success in nearby fields, having drilled 80 wells without any critical issues.

CHALLENGE	SOLUTION	RESULT
<ul style="list-style-type: none"> <li>Reactive shale in numerous different formations</li> <li>Bit balling due to sticky clay</li> <li>Loose sand - all of which contributed to longer drill time and subsequently more cost</li> </ul>	<ul style="list-style-type: none"> <li>Avaperm NF™</li> <li>Avagreen Lube™</li> <li>Avatex™</li> </ul>	<ul style="list-style-type: none"> <li>Borehole instability easily managed</li> <li>Wells were drilled and finished in lowest total days and highest m/day ratio</li> <li>Operator saved time and reduced total costs</li> </ul>

## OVERVIEW

A large operator in Oman chose Newpark after the successes in the nearby SAIWAN Field and FARHA field where 80 wells were drilled with Newpark support, without any significant issues. Technical and operational challenges occurring during those campaigns were solved without any NPT recorded.

## CHALLENGE

There were many challenges specific to this formation, including the major issues listed below:

- Reactive shale in many different formations
- Cavings
- Bit balling in the top section due to sticky clay.
- Losses to the formation.
- Loose sand in the upper and mid sections
- Washout in the formation.
- Control of the mud parameters and volumes with high ROP in 12 1/4" & 8 1/2" sections

The lessons learned from similar previous wells allowed Newpark to understand and anticipate the technical challenges expected in these wells. Adapting mud parameters and applying proprietary technology helped Newpark drill these wells safely, without any delays or NPT.

## SOLUTION

Newpark conducted several laboratory studies and QAQC tests, also running the proprietary ClearTrack™ hydraulics simulation software to evaluate hole cleaning and the cuttings carrying capacity of the fluid. This helped Newpark Engineers to fully understand and evaluate the downhole conditions anticipated for the planned wells.

## Case History



The ClearTrack simulation software was used to monitor the density and the pressures in the wellbore while drilling, allowing the engineers to optimize the fluid density when cavings were observed on the surface. Quickly reacting to this issue allowed drilling to be maintained, preventing any loss of wellbore stability.

Proprietary fluids technologies and additives used successfully on the wells included:

### AVAPERM NF™

An Amine-based shale inhibitor for the critical shale formation. The operator had previously used 5% Glycol to stabilize the shale formation, Newpark proposed 2% AVAPERM NF as a technically superior alternative. This solution not only reduced costs but showed better performance in shale inhibition, ensuring encapsulation of cuttings which improved hole cleaning.

### AVAGREEN LUBE™

1% concentration improved the hole cleaning while drilling and shortened the circulating periods at various depths.

### AVATEX™

A partially water-soluble sodium sulfonated asphalt acting as a fluid loss reducer and shale stabilizer reducing the tendency of wall sticking, ensuring safer tripping of pipes and casing. To reduce time lost for back reaming operations, 1 ppb pre-treatment improved tripping time.

While circulating at well TD prior to POOH, the Mud Weight was increased to balance the ECD.

Newpark had previously performed lab studies to understand and compare the inhibition properties of different formulations against formation reactivity. A KCl Polymer mud was compared with the same mud treated with 2% AVAPERM NF by utilizing the Linear Swelling Meter (LSM) test. In addition, the shale recovery, the CEC and MBT method was also used to compare the results with LSM.

In this way, flat time was reduced (maximizing bit on bottom productive time) by minimizing/eliminating reaming with the BHA, wiper and/or check trip.

## RESULTS

The operator was able to control and easily manage borehole Instability and any resulting difficulties to casing running.

The wellbore hole quality and stability while drilling the carbonate reservoir section was improved.

As a result of the fluids program prepared by the Newpark team, the drilling parameters required by the client were achieved without any NPT or Lost Time Incidents (LTI). A high flow rate (3.4m<sup>3</sup>/min) and an average ROP of 85.6m/hr was also achieved.

Bit damage decreased, and the time spent to back-ream the borehole while tripping out of hole was reduced.

In the Ulfa-09 well, Newpark achieved a record performance with lowest total drilling days, lowest total cost, and the highest m/day ratio, as shown in the chart below:

Year	Well Name	Total Time Day	Rig move Day	Total time spud-release days	AH Meter Drilled	AX US\$ Total Well \$	m/day spud-release	AX US\$ / m Total Well \$/m
2016	ULFA-1	117.5	14.8	102.8	4033	\$ 6,722,230	39	\$ 1,667
2017	Samha-01	84.6	4.0	80.6	3850	\$ 5,646,824	48	\$ 1,467
2018	ULFA-2	71.3	5.6	65.7	3850	\$ 4,878,751	59	\$ 1,267
2018	ULFA-3	60.6	3.9	56.7	3811	\$ 4,313,267	67	\$ 1,132
2018	Samha-02	72.7	3.6	69.1	4102	\$ 4,931,838	59	\$ 1,202
2018	ULFA-4	80.4	33.7	46.7	3969	\$ 3,842,972	85	\$ 968
2018	Samha-03	48.7	3.3	45.3	3840	\$ 3,144,245	85	\$ 819
2018	ULFA-5	87.8	19.4	68.5	3844	\$ 4,578,313	56	\$ 1,191
2018	ULFA-6	54.4	4.5	49.9	3878	\$ 3,080,863	78	\$ 794
2019	Samha-05	60.0	4.6	55.4	3828	\$ 3,640,847	69	\$ 951
2019	ULFA-8	48.5	5.5	44.0	3443	\$ 3,539,240	78	\$ 1,028
2019	ULFA-9	41.0	7.7	33.3	3426	\$ 2,990,000	103	\$ 873