2. INTERVAL DISCUSSIONS

2.1 36 & 26" Section
2.2 17 1/2" Section
2.3 12 1/4" Section
2.4 8 1/2" Section

2.1 INTERVAL DISCUSSIONS contd

36" (914 mm) HOLE

Kingfisher # 1 was spudded on the 20th May 1994 by the Ron Tappmeyer. The sea-floor was tagged at 55m and the 36" conductor hole drilled to 95m using seawater and 50 bbl high viscosity flocculated gel sweeps on connections. The hole was then swept with a 50 bbl high viscosity flocculated gel pill and displaced with 200 bbls of high viscosity pre-hydrated gel. A wiper trip was made without drag or fill on bottom. The hole was then displaced with 250 bbls of high viscosity pre-hydrated gel, and 30" casing run with the shoe cemented at 93.6m.

26" (660 mm) HOLE

70 bbls of pre-hydrated gel mud were added to the the existing 740 bbl system while nippling up the diverter assembly. 26" hole was drilled to 332m using seawater and 40 bbl high viscosity flocculated gel sweeps twice every stand. The hole was then swept with 160 bbls of high viscosity flocculated gel mud and displaced with 700 bbls of high viscosity pre-hydrated gel (open hole volume 510 bbl). The drill string was pulled out and 30" conductor pipe slacked-off to ensure there was no movement. The 26" bit was re-run and another 7m drilled to a casing point of 339m. The hole was circulated and displaced with 700 bbls of high viscosity pre-hydrated gel, having been prepared while making a trouble free wiper trip. 20" casing was then run and cemented with the shoe set at 338.6m.

Comments

There were no significant hole problems whilst drilling these sections. Both intervals were drilled with sea-water and high viscosity pre-hydrated gel sweeps to flush cuttings from the hole. A total of 2700 bbls of gel fluid were used to drill these sections.There was some chloride contamination when drill water was used for engine cooling purposes while preloading. Drill water was regularly checked to be around 3000 mg/l chlorides with a hardness of 480 mg/l (both relatively high). Additions of soda ash and caustic soda were used to treat the hardness to below 100 mg/l for effective gel pre-hydration. Sweeps of 40 bbl were pumped each 15m or as the hole condition required as these two sections were drilled without problems. Gel consumption was higher than estimated, partly due to depressed yield caused by the relatively high concentration of chlorides in the drillwater. However the section mud cost was 25% less than estimated due to effective farming of volume which resulted in a 37% reduction in volume consumed.

	ESTIMATED	ACTUAL	VARIANCE
Mud Cost (A$)	39,906.87	29,951.56	-24.95%
Volume (bbl)	4280	2700	-36.9%
Volume Left (bbl)	0	0	0

2.2 INTERVAL DISCUSSIONS

17-1/2" (444 mm) HOLE

After nippling up the diverter assembly and the return mud flow line to 20" casing, a 17-1/2" drilling assembly was picked up and run to bottom. Cement was tagged at 335m and the 20" casing shoe drilled using sea-water and dumping returns. After drilling the 20" shoe 1300 bbls of gel/polymer mud, prepared whilst nippling up, was displaced to the hole. The gel/polymer mud had been prepared by pre-hydrating gel in drillwater in one pit, mixing Bio-Lose and Mil-Pac into seawater in the other pit, and then blending the two fluids together. The hole was circulated with 100 bbls of seawater before it was displaced with the new mud.

A wiper trip at 580m showed that the hole was in good condition. Drilling continued to 766m where another wiper trip experienced tight spots at 636m (10 MT overpull) and 667-638m (20 MT overpull). The hole was then back reamed to 579m. A trip for a bit change was made at 869m. The hole was again back-reamed from 812m to 338m. 15m of fill were washed when pipe was run back in the hole. The third wiper trip and the wiper trip before logging also required back reaming. Calliper logs confirmed the hole was under gauge.

The hole was conditioned at the casing point of 1090m, with a 100 bbl high viscosity sweep and a 100 bbl high viscosity pill spotted on bottom. The trip out showed that the hole was in good condition and electrical logging was performed without problems. After logging a wiper trip was made and the 13-3/8" casing run to bottom and cemented without problems, with the shoe at 1083m.

Comments

The 17-1/2" hole was drilled using gel/polymer mud with relatively stable mud properties throughout this interval. Rheology was maintained as required with pre-hydryated gel and Mil-Pac. XCD polymer was used when there was a shortage of drillwater for rheology maintenance. The 6 rpm reading sheared down with circulation but was maintained between 14-18 for adequate 17-1/2" hole cleaning. Hole conditions were good, confirming adequate hole cleaning. However, tight hole during trips required back-reaming which indicated that high formation porosity may have caused filter cake build up. Electrical logs showed that the hole was almost 1/2" under-gauge. A lower water loss and XCD polymer instead of pre-hydrated gel may provide a better fluid for drilling this section in future wells in this area.

A low mud weight between 1.08 and 1.10 SG was maintained by running solids control equipment at all times. By use of 84 mesh shaker screens mud volume consumption was minimized due to reduced dilution for mud weight control. This resulted in a 15% reduction in estimated mud costs and a 28% reduction in estimated mud volume consumption.

	ESTIMATED	ACTUAL	VARIANCE
Mud Cost (A$)	56,278.00	47,760.35	-15.13%
Volume (bbl)	5300	3800	-28.3%
Volume Left (bbl)		300	

2.3 INTERVAL DISCUSSIONS contd

12-1/4" (311 mm) Hole

Whilst nippling up, 1000 bbls of 5% KCl/New-Drill Plus mud were mixed and blended with the 300 bbls of salvaged gel/polymer mud (which had been conditioned by passing through 210 mesh screens). The blended fluid was then sheared using rig equipment and the Flo-Trend Jet Shearing Hopper. A coarser 50 mesh screen was installed on the "Triton" shaker and, after drilling cement from 1053m to 1067m, the hole was displaced to the KCl/New-Drill mud. The hole was then drilled to 1093 m and circulated clean before a leak-off test was performed to an E.M.W. of 1.25 SG. Cement was tagged at 1093m, instead of 1079m as expected, and the bit was pulled. The pipe was run back open ended and 20 bbls of seawater were pumped followed by a cement plug. Another 3 bbls of seawater were pumped behind and the cement plug displaced with mud. The pipe was pulled back to 1015m and reverse circulated at 150% of the drill pipe volume.

A 12-1/4" bit and BHA were picked up and run in the hole, tagging cement at 1055m, which was then drilled from 1055m to 1093m. The mud had been pre-treated with citric acid and sodium bicarbonate to minimise cement contamination. After drilling cement the bit was pulled back to the casing shoe and a leak-off performed to less than 100 psi. Downhole losses were monitored and reported at 12 - 25 bbl/hr. A 50 bbl LCM pill was prepared, consisting of 37 lb/bbl W.O.30F and 43 lb/bbl dry gel, and spotted on bottom with steady losses.

After spotting the LCM pill the bit was pulled back to 980m, where the mud was circulated and losses monitored. In total 41 bbls of mud were lost to the hole. The bit was pulled back to surface and laid down. Another cement plug was pumped after running in open ended to bottom. Cement plug #3 was spotted at 1093m and the pipe pulled back to 1015m. The mud was reverse circulated until bottoms up. The rams were closed and cement squeezed at 250 psi and pressure held for one hour. The pipe was pulled back to surface and a new B.H.A picked up and run in.

The cement plug was tagged at 1050m and drilled out to 1127m using the KCl/New-Drill Plus mud pretreated with citric acid and sodium bicarbonate. The pH of the mud stayed high at 11.6 in spite of the pre-treatment, with additional corrective treatments being made while drilling. Rheology continued to drop due to the reduced performance of the viscosifying polymer in the high pH environment. Milguar was preferred in lieu of XCD polymer to maintain the desired viscosity. Drilling continued with no hole problems, although extra additions of New-Drill Plus were made to compensate for the loss of this polymer due to hydrolysis.

At 1271m a wiper trip was made to the 13-3/8" casing shoe with no indication of drag, although downhole losses at the rate of 0.5 bbl/hr were noted. No fill was found on running back to bottom. At 1474m bottoms up was circulated and the bit pulled with a maximum overpull of 25 MT between 1354m and 1340m. A new bit was run, washing from 1448m to 1474m as a precaution. At 1580m total loss of mud returns occurred, with approximately 140 bbls of seawater being pumped down the annulus to fill the hole (without success). The well was monitored and the pipe worked while mixing an LCM pill. Circulation was stopped to reduce the possibility of exposing the open hole to seawater. Mud was pumped down the string at 10 spm while the LCM pill was formulated as follows :-

1. Kwikseal (M)	30 lb/bbl
2. Mica (M)	30 lb/bbl
3. W.O.30 (F)	25 lb/bbl
4. PHG	30 lb/bbl

65 bbls of high viscosity PHG fluid was circulated followed by 83 bbls of the LCM pill. The pills were displaced to the bit with 80 bbls of mud at one bbl/min. No changes in pump pressure occurred while pumping. As the pill was being displaced through the bit it was possible to see the top of fluid level in the annulus at +/- 50m. The bit was then pulled back to the shoe to monitor the well. The annulus was filled with seawater at the theoretical pipe displacement

2.3 INTERVAL DISCUSSIONS contd

volume while pulling back to the shoe. No rise in fluid level was observed while pumping seawater. The well was monitored while mixing extra volume and another LCM pill.

While mixing new mud the annulus was filled with inhibited KCl seawater. The fluid level rose to the flow line after pumping 35 bbls, indicating the top of the fluid column had been 88m below the rotary table. However losses continued and the annulus rapidly dropped out of sight. A further 30 bbls of KCl seawater was pumped into the annulus, but no fluid level was visible.

Approximately 300 bbls of mud were lost to the hole and a total of 275 bbls of seawater pumped into the annulus. A further 62 bbls of seawater were pumped to the annulus (theoretical pipe displacement) while tripping out. This created a theoretical column of 690m of water in the hole.

5" drill pipe was run in open ended to spot a cement plug. Approximately 28 bbls of inhibited KCl seawater were pumped followed by cement plug #4 at 1580m. This plug was displaced with 40 bbls of mud and 42 bbls of inhibited seawater. Flowline returns were observed during the whole cement operation. Pipe was pulled back to 1500m and the well observed to be static. The pipe was then pulled back to the casing shoe and the hole monitored. Fluid losses at rate of 2 bbls/hr were observed while waiting on cement, and the annulus filled with KCl/New-Drill Plus. The pipe was then pulled out and BOP's tested.

After testing BOP's the bit and BHA were run in, tagging cement at 1531m. Drillpipe was filled while running in and a pressure increase observed. However no fluid could be circulated, with the bit being pulled for suspected plugged jets or pipe. 7m of drillpipe were found to be plugged with LCM and cement. The plugged pipe was laid out and the bit re-run, reaming from 1413m to 1531m. Cement was drilled from 1531m to 1580m with full returns until returns were again lost. Drilling continued to determine the extent of the loss zone. The fluid level was found to be static at the flowline while pumping at 600 gpm to 700 gpm. The pipe was worked after drilling every 3m. While working the pipe approximately 150 bbls of diluted LCM pill was circulated through the bit, with a further LCM pill being made up. Composition of the diluted LCM pill was as follows :-

1. Milseal (M) 15 lb/bbl
2. Mica (M) 18 lb/bbl
3. PHG 10 lb/bbl

The new LCM pill was formulated as follows :-

1. Milseal (M) 15 lb/bbl
2. Mica (M) 28 lb/bbl
3. Kwikseal (M) 23 lb/bbl
4. Nut Plug 47 lb/bbl

80 bbls of high viscosity PHG slurry was circulated, followed by 237 bbls of LCM pill. These were displaced with 90 bbls of KCl/New-Drill Plus fluid. The bit was then pulled back to the shoe filling the annulus with the theoretical pipe displacement. Tight hole at 1570m to 1480m, and 1344m experienced 5 to 15 MT overpull. Another 45 bbls of fluid were circulated through the pipe and annulus without the fluid level rising. While observing the well a third LCM pill was prepared and formulated as follows :-

1. Kwikseal (M) 40 lb/bbl
2. Nut Plug (C/M) 41 lb/bbl
3. Mica (M) 24.5 lb/bbl
4. W.O.30 (M) 24.5 lb/bbl
5. PHG 30 lb/bbl

2.3 INTERVAL DISCUSSIONS contd

The bit was run and drilling commenced using seawater and PHG hi-viscosity sweeps of 25 bbls for each 5m drilled, and a further 50 bbls on each connection. Drilling continued to 1631m with partial to total losses.

At 1633m PHG fluid was circulated, followed by 170 bbls of LCM pill, and chased by 30 bbls of PHG fluid. These pills were displaced downhole with 80 bbls of KCl fluid. The bit was pulled to the shoe to let the pill permeate through the loss zone. While waiting, 241 bbls of seawater was circulated through the annulus without any fluid level increase. The bit was pulled out while the annulus was filled with seawater at the theoretical displacement volume. Pipe was run back open ended to set cement plug #5.

Cement plug #5 was spotted on bottom prior to pulling the pipe to 1487m. After lines were flushed the pipe was pulled to the shoe. While waiting on cement the annulus was filled with seawater with losses recorded at 285 bbl/hr, compared to losses of 1000 bbls/hr previously.

The bit was run back, tagging top of the cement at 1587m. Cement plug #6 was spotted and displaced with seawater. The pipe was pulled back to 1429m and lines flushed with seawater before pulling to the shoe. While waiting on cement the hole was filled with seawater and monitored. Losses were recorded at 240 bbl/hr while filling the hole.

Pipe was run in, tagging the top of the plug at 1583m, an improvement of 4m. Another cement plug was spotted, with an LCM pill ahead. The remaining 100 bbls of LCM pill #3 were pumped followed by cement plug #7 and displaced with seawater. The pipe was pulled back to the shoe with fluid level static at sea level. While waiting on cement an attempt was made to fill the annulus using seawater, establishing losses at 300 bbls/hr.

The pipe was run in, tagging top cement at 1583m with losses of 300 bbls/hr. A 25 bbl pill of Dowell "Zone lock" was prepared, and displaced to the hole with seawater. No increase in fluid level was evident. Pipe was pulled out and a 12-1/4" bit and BHA run. Cement was tagged at 1584m. Drilling continued with seawater to 1633m, using a closed system, with partial returns. The hole was swept clean with 50 bbls of PHG hi-viscosity sweep every 10m drilled. At 1663 a drop of 200 psi pump pressure was observed, coupled with a loss of 21 MT in string weight. The pipe was pulled out, leaving 112.74m of BHA and the bit on bottom. An overshot was run to latch on to the fish at 1551.1m. The fish was recovered with 38 MT of overpull, without the jars firing, and the fish laid out at surface.

A new bit was run with no fill on bottom. Seawater was used to drill ahead with 25 bbl Milguar hi-viscosity sweeps circulated every single. At 1663m a survey was dropped and the pipe pulled to 1550m. The line parted as the survey was recovered, with the pipe being pulled to surface to recover the survey barrel. Drilling continued with 65-70% losses. Returns improved while drilling with losses reducing to 40%.

At 1817m, due to low penetration, the bit was pulled to log the 12-1/4" hole. 100 bbls of high viscosity PHG was spotted on bottom prior to pulling out. 6.29m of the BHA were left on bottom. An 11-3/4" overshot was run to the top of the fish at 1810.71m. The fish was engaged but not recovered at surface. A second attempt engaged the fish, but again without successful retrieval. A third attempt engaged the fish with 50 MT overpull. 100 bbls of PHG were spotted on bottom prior to pulling out with the fish. However the survey barrel was left on bottom. Schlumberger was rigged up and electric logs run without problems.The calliper showed the hole to be badly washed out.

A bit was run and tagged the survey barrel at 1814m, milling it with 50 bbl sweeps of hi-viscosity Milguar fluid. Another 100 bbls of hi-viscosity PHG was spotted on bottom prior to pulling out to run 9-5/8" casing. The 9-5/8" casing was run and the shoe cemented at 1814m without problems.

2.3 INTERVAL DISCUSSIONS contd

Comments

This section started with a poor leak-off test, was followed by cement squeezes which failed to impart integrity to the shoe, and suffered unsuccessfully sealed severe lost circulation. Other problems included two twist offs of the BHA, failed fishing attempts and junk left in the hole.

After setting the 13-3/8" casing shoe the leak-off was conducted but with poor formation integrity. In total three cement pills were squeezed below the shoe without success. The decision to set casing at this depth, based on geological evidence, needs to be re-examined in the light of problems experienced in the drilling operation.

The need for cement plugs caused an abnormally high mud pH. This contributed to the breakdown of XCD Polymer, Mil-Pac and the hydrolysis of New-Drill Plus, a PHPA polymer. In spite of pre-treatment with citric acid and sodium bicarbonate, the cement plugs significantly increased contamination and caused the pH to increase to 12.0. After drilling cement from 1050m to 1126m, a 76m thick column, the drilling fluid lost its rheological and fluid loss control properties. The addition of Milguar raised the rheology, and was preferred to XCD Polymer in a high pH environment. Also damage to Mil-Pac due to high calcium was unavoidable. Drilling of cement plugs with KCl/PHPA mud should be avoided wherever possible.

The cement contamination caused a reduction in the encapsulating properties of the PHPA polymer. Although all solids control equipment was optimized and fine mesh shaker screens were used, there was a rapid build up of drill solids. Sand traps were dumped regularly. However this was expensive in new volume being mixed, and in needing time to pre-shear (new mud again increasing the inefficiency in shale shaker performance). Mud weight was necessary to be controlled, so the sand traps were dumped as dictated by drilling conditions, thereby contributing significantly to the high section mud cost. No fill on bottom or tight connections were observed whilst drilling. The hole was indicated to be in gauge by carbide return times.

The severe losses encountered in Kingfisher #1 were responsible for the high section mud consumption, and thus the section mud cost, being almost triple the programmed value. LCM pills were mixed with Kwikseal (M), Mica (M), WO.30 and Nut Plug to provide a range of particle sizes. The use of Kwikseal (C) together with medium grade Nut Plug and Mica is suggested for future Limestone losses of this type. It is believed that cement plugs might be a solution if the full extent of the loss zone can be determined. It may be necessary to drill blind and use high viscosity flushes every few metres drilled until the entire thief zone is exposed. This has the advantage of allowing the zone to be sealed with a single sizeable pill thereby reducing mud contamination. By minimising losses with LCM pills before pumping cement plugs, setting-up time can be gained, which increases the chance of a permanent seal.

Badly washed out hole was expected in the lower zones after the necessary use of seawater to drill thief zones. However the KCl/New-Drill Plus fluid inhibited upper formations and kept them in gauge. The KCl/New-Drill Plus fluid performed well in keeping the hole stable to 1580m (severe losses) and is suggested on future wells. However in view of possible losses it may be advisable to modify formulation dependant on hole conditions, with both low KCl at 3% and New-Drill Plus at up to 0.5 lb/bbl maximum.

	ESTIMATED	ACTUAL	VARIANCE
Start Volume (bbl)		300	
Mud Cost (A$)	74,154.90	183,535.03	147.5%
Volume (bbl)	2570	6140	138.9%
Volume Left (bbl)		1025	

2.4 INTERVAL DISCUSSIONS

8-1/2" (216 mm) Hole

After testing BOP's an 81/2" bit was run. Cement and the shoe were drilled out with seawater, with returns dumped overboard. At the shoe a 50 bbl hi-vis PHG sweep was circulated to clean the hole. The hole was then displaced to pre-treated KCl / PHPA fluid. New formation was drilled to 1821m and the hole circulated clean prior to conducting a leak-off to an equivalent mud weight of 1.74 S.G. Whilst drilling cement no contamination effects were noted due to pre-treatment, however the fluid displayed high bicarbonate alkalinity requiring some lime to reduce the Mf.

At 1929m a pressure drop coupled with high torque was observed. On tripping out the bit and shock sub had been left downhole. An overshot was run, engaging and retrieving the fish. After laying out the fish a PDC bit was run. Drilling continued as background gas increased. Mud weight was increased to 1.12 S.G. The desilter was switched to mud cleaner mode to salvage barite.

An initial penetration rate of 8 to 10 m/hour slowed to less than 1m/hour. At 1947m the PDC bit was pulled out of the hole and found to be badly damaged due to highly abrasive formations. Drilling 8-1/2" hole continued to 2089. A bit trip was made with a tight spot from 1933m to 1925m, with overpull of 30 MT, and the bit showing 1/16" undergauge. Drilling continued after washing and reaming from 2001m to 2089m (0.5 m fill on bottom).

A flow check showed positive after a drilling break at 2120m. No initial SIDPP was recorded. The well was circulated through the choke while raising mud weight to 1.18 SG. A second shut in well pressure showed a SIDPP of 100 psi and a SICP of 75 psi. Suction pit mud weight was raised to 1.30 SG with Barite. The well was killed while maintaining the mud weight at 1.30 SG in and out. Drilling continued to 2252m. The bit was pulled with the hole shown to be in good condition. The bit was 1/16" undergauge. The hole was reamed from 2176 to 2252m as a precaution with the new bit.

At 2294m a drilling break showed an increase in gas to 30%. The hole was flow checked at 2294m and 2299m. Mud weight was raised to 1.35 S.G. whilst circulating, and to 1.38 S.G. whilst drilling ahead. Drilling proceeded to 2486m where a bit trip was tight on the way out, with 44 MT overpull at 2144m. Significant reaming was necessary on running back in. Mud weight was raised to 1.42 S.G. Overpull up to 55 MT on the next trip at 2574m, and long sections of hole which needed reaming required that mud weight be increased to 1.55 S.G. by 2686m. The KCl content of the mud was increased from 7.5% to above 10% and subsequently, on operator's instructions, above 15% by 2800m.

At 2813m high torque caused the bit to be pulled, with 3 cones left downhole. A reverse circulation junk sub was run and retrieved significant metal. A mill and junk sub were run, and junk drilled to 2818m. The mill and junksub were pulled out and bit # 19 run with a junk sub. A bridge was worked at 2668m (5 MT). The bit was then run to bottom with no fill on bottom. Another trouble free bit trip was made at 2823m (except for a minor bridge at 2803m).

A pilot test on a rig sample of mud was made at 2823m, with 1%, 2%, and 3% Aquacol being added to determine the effects of the glycol on the mud system, as a potential wellbore stabiliser. No adverse effects on the mud rheology were noted. (see Appendix 1 for the test results).

Torque build up at 2854m required the hole to be circulated and clean sticky cuttings from around the stabilisers. Torque was reduced and drilling resumed to 2910m, where a bit trip was made. The trip out experienced tight spots at 2860, 2448 and 2436 m with up to 20 MT overpull. The rest of the hole was in good condition. A new bit and stiffer BHA were run to drop hole deviation, as last two surveys were 5.5 and 2 degrees at 2909 m and 2813m respectively. Tight sections were washed and reamed on running in from 2135 to 2436m, and from 2746 to 2910m. The bit was found to be 1/8" undergauge.

2.4 INTERVAL DISCUSSIONS contd

The hole was drilled to 2978m where a bit trip experienced tight spots at 2797, 2540 to 30, 2496 to 53, 2366 and 2241m with maximum overpull of 40 MT. Drilling operations ceased for almost 36 hours for drill collar and top drive inspections. A bridge at 1999m was reamed when the bit was re-run before drilling continued.

A bit trip was made at 3058m, experiencing tight spots at 2551 and 2497 to 23m with a maximum overpull of 40 MT. BOP's were tested and a bit run in through tight spots at 2154, 2376 and 2414m. The hole was washed from 2981 to 3048m and then reamed to bottom. Drilling continued to 3131m. New-Drill Plus and KCl concentrations were increased. A bit trip at 3131m had minimal tight hole. Damaged shaker screens were replaced, having contributed with mudstone to a slight increase in LGS content, consequently increasing PV.

At 3168m some depletion of encapsulating polymer was noted over the 200 mesh Derrick shakers. New-Drill additions were made to ensure an excess of polymer above 1 lb/bbl. A dilution with pre-mix reduced the weight to 1.565 S.G. and controlled an increasing rheology. A bit trip at 3195m had one tight spot, with overpull less than 20 MT. The bit was found to be 1/4" undergauge. A new bit was run to bottom, washing spots at 2370m and 2520m.

Total depth was reached at 3257m and a wiper trip made trouble free. A 50 bbl high viscosity pill was swept around the hole before pulling out to log, returning 1000 strokes late, indicating considerable washout. No increase in cuttings volume was noted at the shakers. The trip out showed virtually no overpull.

After successfully running the first suite of logs the wireline became stuck while running back for a check run at 2573m. Stretch measurements indicated sticking just below the shoe at a point where the hole dog-legged from 1 to 5 degrees. As the line could not be pulled free at the weak point it was necessary to strip over the line with drill pipe. At 1940m it came free and the logging tools were pulled into the catcher and retrieved.

A near bit stabilizer was picked up and the deviated section of hole reamed with significant load up of shakers. The stiff B.H.A. was run to 3173m, reaming any tight spots. After circulating the hole clean the trip out was trouble free. Several logging attempts were made with various tool configurations including sinker bars and a swivel joint. Tools could not pass 2110m. A bit was run again, reaming the bridge, with the hole being circulated clean before pulling out without problems to re-run logs.

A full suite of logs, including two sidewall coring runs, was then successfully run. Another wiper trip was made, working through all tight spots to bottom before pulling out without problems. Schlumberger was again rigged up and although a successful RFT run was made to the zone of interest, tools would not pass 2553m. Another wiper trip was made, reaming tight spots to bottom, and the hole circulated clean before pulling out to make another logging run.

After a check shot logging run which reached 3254m without problems thye hole was plugged and abandoned. A 3-1/2" stinger was run to 2200m where a 50 bbl balanced cement plug was pumped. After pulling five stands the hole was reverse circulated and 50 bbls of cement contaminated mud dumped at the shakers. After W.O.C. the plug was tagged at 2249m and a second cement plug spotted at the shoe. This plug was tagged and the casing filled with mud, treated with 0.1mg/l biocide prior to casing retrieval and abandonment.

Comments

Fluid recovered from the previous section was conditioned with New-Drill Plus and blended with newly mixed mud to drill 8-1/2" hole. Cement pretreatment was made, possibly slightly to excess.

2.4 INTERVAL DISCUSSIONS contd

Whilst drilling out high torque and lost pump pressure at 1929m necessitated a trip, leaving the bit and shock sub on bottom. The fish was recovered on the first attempt experiencing no hole drag.

Slow penetration was achieved. The hardness of the formations was evidenced by the total destruction of the new bit by 1947m. This was echoed later with the loss of three cones downhole. Although these old (Carboniferous) formations should be expected to drill slowly, fluid parameters must be considered to maximize drilling performance and minimize damage to downhole equipment. High PHPA polymer concentrations must be maintained to ensure hole stability and clay control. The use of lubricants and other surfactants can be cost effective when properly applied.

Detergent was added to the fluid below 2000m to reduce surface tension. A better removal of drill solids appeared to result. No aeration problems were noted on the use of this detergent.

KCl concentration was maintained at a minimum of 7% after encountering reactive clays below the shoe. This was shown by high MBC values and further dispersion tests on the rig where some claystones were shown to be very dispersive. This re-inforces the need for excess New-Drill Plus to be available for cuttings encapsulation, maximising primary removal at the shakers. Clays below 1940m displayed silicious lithification and crystallisation. Although posing no hole instability from hydration, interbedded reactive clays would wash out should the fluid's inhibitive ability be compromised. Such clays may not so obviously appear as cuttings over the shakers. To maximize hole stability and minimize drilled solids KCl should be set at a minimum of 6% with increases as required dependent on the usage of the Potassium ion by the formations.

At 1942m the fluid density was raised to 1.12 S.G. due to the presence of continuous back ground gas. A high pH was associated with addition of barite. The pH of 10.2 was thought to be due to cement contaminated barite, and was confirmed with phenolphthalein.

A positive flow check at 2120m required a system weight up to 1.35 S.G., though without adverse rheological changes from the solids additions. Several drilling breaks and high levels of background gas dictated further mud weight increases in stages to 1.55 S.G. by 2686m. Throughout this interval the KCl concentration was also increased to above 15%, ensuring maximum inhibition of the claystones. The caliper log showed a gradual improvement of hole gauge from 2500m onwards.

Cones left downhole at 2814m were successfully retrieved, milled or by-passed as drilling proceeded below 3000m, but penetration was slow and the silicified formations restricted bit runs. Additional New-Drill PHPA treatments helped eliminate tight spots when pulling out. Most new bits were run easily to bottom. Caliper logs show the hole to be in gauge in the bottom section.

When logging operations began the upper section of hole had been open almost 40 days. The time dependant stability of hydratable formations probably contributed to the stuck wireline, but filter cake build up in overgauge sections coupled with a 5 degree dogleg, just below the shoe, were thought to be the primary contributors. After reaming this section with a stiff assembly ledges created bridging problems. It was not until a second reaming run had cleaned the hole out that a successful suite of logs could be completed.

The following recomendations for future holes in this area are suggested:-

1. Both New-Drill Plus and KCl concentrations must be replaced after usage at all times in this section. An excess of at least 1 lb/bbl New-Drill Plus must be maintained, with allowances after solids removal at the shakers. KCl must be added to maintain active K+, being monitored in relation to the chlorides. 6% is suggested only as a minimum starting level.

2.4 INTERVAL DISCUSSIONS contd

2. Surfactants such as Milpark MD should be used to ensure full weight passes to the bit, with no loss due to hanging up of the collars or BHA.

3. 3% Aquacol is proposed primarily as a "cloud point" glycol additive over the 8-1/2" section in order to aid in reducing the tendency of stressed shales / clays from sloughing, without such high mud weight increases. This may significantly aid in penetration rate being increased. Simultaneously added chemical inhibition and lubricity would be a benefit.

4. CEC and XRD analysis of a number of caving and cutting samples over the 2590m to 2800m interval did not show any presence of Montmorillionite (typically very reacative), however showed substantial Illite and mixed layer clays. Low CEC's generally were also recorded. This implies that a greater emphasis on stresses within the shales may have led to wellbore instability than chemical reactivity. The use of Aquacol may help to alleviate those stresses, or at least reduce the speed and effect of such stresses being released, causing sloughing into the wellbore. However there may well still be a requirement to raise mud weight to some degree in conjunction with adding a cloud point glycol in order to stabilize the hole.

	ESTIMATED	ACTUAL	VARIANCE
Mud Cost (A$)	33,693.80	325,895.61	867.23%
Volume (bbl)	1090	4568	319.1%
Volume Left (bbl)		300	