

Operator : OCA Ltd
Well : Port Fairy # 1
Rig : Mitchell 50
Spud : 9th January 2002

DRILLING FLUID SUMMARY

FOR: *Oil Company of Australia Ltd*

WELL: Port Fairy # 1

Otway Basin

VICTORIA

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Spud Date: 9th January 2002

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1. SUMMARY OF OPERATIONS

Port Fairy # 1 was an exploration well in PEP 152 of the onshore Otway Basin. The primary targets were the Flaxman and Warree sandstones while the secondary target was the Nullawarree Green sands. The well was spudded @ 0700 Hours on 9th January 2002, TD of 1550 Meters was reached @ 1830 Hours on 18th January 2002 and the rig was released on 24th January 2002.

HOLE SIZE : 17 1/2"
MUD TYPE : Air/Water
INTERVAL : Surface – 78.2 Metres
CASING : 13 3/8" conductor @ 67 metres

The well was spudded @ 07:00 hours on 9th January with 17 1/2" drag bit. As the bit would not drill below 2 metres, a 12 1/4" hammer assembly was picked up and the hole was drilled to 10 metres. The hole was further drilled using 17 1/2" hammer to 31 metres assembly just through basalt into sands. Some basalt cavings were evident at this stage. 23 sacks of cement were mixed and spotted at bottom.

After waiting on cement, the 12 1/4" pilot hole was further drilled using water from the mud tanks with returns to the sump. After drilling to 78.2 metres, the hole was enlarged to 17 1/2". 13 3/8" conductor casing was run in to 67 metres and cemented using rig mixing facilities and mud pumps.

HOLE SIZE : 12 1/4"
MUD TYPE : Spud Gel Mud
INTERVAL : 78 – 821 Metres
CASING : 9-5/8" @ 813 Metres

The make up water (from local bore plus haulage from Port Fairy township) was tested at location and found to have the following properties:

pH	8.5
pf/mf	0.05/0.3
Hardness	200 mg/l
Chlorides	800 mg/l

During waiting on cement on 13 3/8" conductor, the tanks were placed in position. 200 barrels of 20 ppb Trugel 13A and 0.25 ppb Caustic Soda were mixed in the tanks obtaining viscosity of more than 45 sec/qt. The shaker was dressed with 20/30 mesh screens.

A 12 1/4" bit was run in and the cement was tagged at 58 metres. The cement was drilled with gel mud with minimal cement contamination. Whilst drilling through the Limestone and Marl formations, water addition was made to counter the increasing viscosity. The shaker screens were washed continuously to prevent excessive run off from the shakers. Occasional by passing of the Possum belly and shale shakers were required in view of excessive cuttings.

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Mud rings were experienced while drilling at 270 metres due to anticipated Gumbo in lower Gellibrand Marl. The mud had started picking up in gels just prior to mud rings. The flow line was nipped down and cleaned. Provision for jet cleaning of flow line was made and the drilling was resumed. The mud was treated with SAPP (0.3 ppb) at this stage to prevent any mud rings.

The mud yield point decreased to less than 5 lbs/100ft² on addition of the SAPP and again gradually increased during further Marl drilling. Half a sack (0.075 ppb) of SAPP was again added when the mud viscosity increased at 420 m. Mud rings were again experienced during bottoms up after survey at 450 m.

While drilling through Dilwyn formation, Xanthan Gum and Pac Reg sweeps (addition to Suction during connections as no separate pill tank) were pumped around to keep the hole clean in view of low pump discharge (only one mud pump). Enerseal Coarse was also added during Dilwyn sands on operator's request.

As the mud pump started jacking off during pumping of sweeps, these sweeps were discontinued. The shaker screens were upgraded to 60/80 mesh, however the bottom screen was almost immediately replaced with coarser screen (20 mesh) because of excessive run off. The upper screen was also continuously hosed in view of sand blinding.

A wiper trip to the drill collars was made after drilling to 818 metres. After drilling another 3 metres to 821 metres, for casing shoe adjustment, the pipes were pulled out. The pipes were slugged both prior to Wiper trip and the final pull out.

9 5/8" (47 ppf) casings were run in with shoe at 813 metres. After circulating the hole, the casings were cemented displacing the cement slurry with the mud. A good amount of cement slurry surfaced during displacement.

HOLE SIZE : 8½"
MUD TYPE : KCl - PHPA – Polymer
INTERVAL : 813 Meters – 1550 Meters
CASING : 7" Casing

During nipping up of the BOP's, the mud tanks were dumped and cleaned. 250 barrels of fresh KCl-PHPA-Polymer mud was mixed in the settling and suction pits (keeping 90 barrels in trip and reserve tanks), isolating sand-trap as suction for sand trap:

JK-261 (dry PHPA)	0.22 ppb
PAC-R	1.75 ppb
Xanthan Gum	0.22 ppb
KCl	37 ppb

The KCl concentration (10.5 %) was higher than recommended (3-4%) so as to have the initial mud weight of 8.9 ppg (1.07 SG) as requested by the operator. The fluid was sheared through the gun lines while the shakers were dressed with 20 / 40 mesh screens.

The cement was tagged at 774 meters with the 8 ½" bit. The shoe track and 2 meters of new formation to 823 meters were drilled with the mud from previous interval using the sandtrap as the

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suction. After circulating the hole clean, an extended LOT was conducted obtaining EMW of 13.5 ppg.

The hole was displaced with fresh KCl – PHPA mud after LOT. A deviation survey was conducted immediately after displacement (the survey prior to casing was a miss-run), which gave enough time to mix another 140 barrels of fresh mud to replenish the surface volume. PHPA was not added to this fresh batch to avoid any run off from the shaker.

The drilling resumed after the survey. There was no run off from the shakers. PHPA (dry) was added, initially through the reserve tank but as the frequent shifting of the flexi-pump for water, pre-mix and other works became cumbersome, so continuous dry addition was started in the tanks to keep up with the drilling. The approximate rate of addition was 1.35 lbs per metre of formation drilled. The formation was argillaceous in nature but the cuttings were dry and well encapsulated.

The mud volume was built up with water and simultaneous addition of PAC –Reg. Xanthan Gum was added whenever required to maintain hole cleaning. Only one triplex mud pump with 7” stroke length and 6” liner was available, so the mud yield point was allowed to build up in view of lower pump discharge (310 – 325 gpm).

The yield point was more than 15 lbs/100ft² in the beginning and was allowed to gradually build to more than 17 lbs/100ft² as the drilling progressed though PHPA (dry) addition also accounted for some of this higher rheology.

The mud weight increased to 9.2 ppg (1.10 SG) while drilling at 1200 metres. Attempts were made to up grade the shaker screens but without success, so coarser screens were continued. While drilling at 1236 metres, gas up to 25 units was recorded. The mud weight was increased to 9.5 ppg (1.14 SG) on operator’s request using Barytes.

The drilling after 1236 metres was controlled with less weight on bit. The ROP became very poor at 1327 metres so it was decided to pull out of hole. A baryte slug was pumped which was mixed in the suction tank after stopping the circulation. The PDC condition was O.K. on pulling out.

A new tri-cone bit was run in. On encountering a ledge at 874 metres, further running in was done with washing and reaming. The availability of a top drive, facilitated this washing down. 20 metres of fill were encountered at bottom. During washing and reaming, Xanthan Gum and Pac Reg additions were made and the yield point was increased to more than 20 lbs/100ft².

On resumption of drilling, the yield point was continued to be maintained more than 20lbs/100ft². PHPA addition had to be decreased because of higher rheology and non-availability of any pre-mix facilities. The PHPA rate of addition was still 0.95 lbs per metre of formation drilled. The concentration of Pac Reg was kept on higher side. KCl addition was not required as the same was still more than 4 %.

The mud weight gradually increased to 9.6 – 9.7 ppg (1.15 – 1.16 SG) while drilling through lower Flaxman and Eumerrella formations. Although the desander and the desilter were run continuously, the sand was more than 1.0 % while drilling these formations though the MBC values were still low.

TD of 1550 metres was reached at 18:30 hours on 18th January 2002. After circulating the hole clean, the pipes were pumped out utilising the top drive facilities. As it was decided to pump out the pipes so the slug was not pumped thus the pull out was wet.

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POST TD

After pulling out, Schlumberger was rigged up and two runs of logs were recorded. Fill was encountered at 1523 metres during logging. After rigging down Schlumberger, test tools were run in and DST # 1 was conducted. After deflating the packer, the pipes were pulled out to 2nd object. Attempts to seat the packer failed so test tools were pulled out.

The sample chamber was found plugged with sand on pulling out. During logging and DST operations, 70 barrels of mud was mixed in the surface tanks to make up for the volume lost during wet pull out. Pac Reg was the only polymer used while building up the volume.

The old bit was run in for a wiper trip. Fill was encountered at 1513 metres. After circulating bottoms up at 1513 metres the pipes were pulled out. Water along with Pac Reg, Caustic and Idcide was added during circulation to build up the volume. After pumping slug, the pipes were pulled out.

Test tools were made up and run in for DST # 2 in Parratte. The tools got plugged after initial build up. The test tools were pulled out. Another trip was made after DST # 2. The fill from 1506 metres was washed and reamed. Xanthan Gum high viscous mud was pumped around during final bottoms up. A slug was pumped and the pipes were pulled out.

DST # 3 tools were run in to repeat the test in the Parratte formation. The packer did not inflate. The tools were pulled out and 7" casing was run in without any fill with shoe at 1546 metres. The casing was cemented, displacing the slurry with water and bumping the plug.

The rig was released on 24th of January 2002.

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2. OBSERVATIONS, RECOMMENDATIONS AND WELL ANALYSIS

The well Port Fairy # 1 was drilled to TD of 1550 meters. Two run of wireline logs and three DST's were carried out during post TD evaluation. The logging runs were successfully conducted though the test tools got plugged during DST # 1 and DST # 2 while the packers did not inflate for DST # 3 (re-test of DST # 2 object).

<i>HOLE SIZE</i>	<i>INTERVAL</i>	<i>Meters</i>	<i>COST</i>	<i>COST / FT</i>
12 1/4"	0 – 821. Metres	821	\$3309.42	\$ 4.03
8 1/2"	821 – 1550 Meters	729	\$ 13003.69	\$ 17.84
TOTAL DRILLING COST (1550 Metres)			\$ 16,313.11	\$10.52
POST TD COSTS (logging / completion)			\$ 2,367.98	
TOTAL WELL COST			\$18,681.09	\$ 12.05
DAMAGED COST			\$ 131.72	
TOTAL COST (Damaged + Used)			\$ 18,812.81	

12 1/4" Surface Hole

The surface interval was drilled with Gel Spud Mud at the cost of \$3,309.42 i.e. \$ 4.03 per metre.

13 3/8" conductor was set at 67 metres so losses were not encountered in the upper limestone formations. Mud rings were experienced while drilling through the Marl section especially Gellibrand Marl. SAPP addition was made which helped in thinning down the mud.

Pac Reg and Xanthan Gum sweeps were pumped around while drilling through Dilwyn sands. The losses were not significant. LCM (Enerseal Coarse @ 1 ppb) though was added on Operator's request. The addition of Pac Reg provided stability to the mud system though yield point was only 10-11 lbs/100ft² at TD. Casing was run in without any problems. Good quantity of cement surfaced during displacement with mud.

8 1/2" Production Hole

This interval was drilled using KCl PHPA mud at the total mud cost of \$ 13,003.69 or \$17.84 per metre again without any major mud related problems.

The initial mud weight was kept 8.9 ppg (1.07 SG) using KCl in anticipation of aquifer pressures. The mud weight was further increased to 9.5 ppg (1.14 SG) using Barytes when some gas indications were there in claystones prior to Nullawarre Green sands.

The hole was drilled without any major problems except for some fill during bit and logging trips (1523 metres). No wiper trip had been made prior to logging and DST # 1. The running in of 7" casing was smooth without encountering any fill at bottom with casing shoe at 1546 metres.

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Solids Control

The rig had very basic and inferior solids control system. The single double deck shaker could be operated with coarse screens (20 /30 to 60/20 mesh) during surface hole and any attempt to upgrade the screens resulted in run off from the shakers.

The desilter and desander (single cone) were available but were operated through single hopper pump. The desander had been requisitioned for this well but as the feed system was not properly set so effectiveness of hydrocyclones was low. As the cut size of screen was around 234 microns, so load on hydrocyclones was very high.

The settling in sand trap was utilised but faulty dump gate and lack of any high-pressure water hose for cleaning made it difficult to clean the sand trap frequently. The sand trap was dumped during surveys and trips only.

There was no direct dumping provision of the possum belly in the sump and the same had to be dumped through the sand trap. Though the possum belly was dumped frequently but it only added to solids in the sand trap.

Provision of gumbo sliding by pass line was an advantage, but lack of any proper jetting provision in the flow line resulted in non-productive rig time. Due to low operating volume, the LGS were only around 7.0 % by surface target depth despite drilling 821 metres of 12 ¼" hole.

During production interval, the shaker screens had to be downgraded to 20/40 mesh (cut size of 381 microns) because of the polymers. The shaker screen could not be upgraded due to continuous direct addition of PHPA. The PHPA addition in the pits further lowered the efficiency of solids control hydrocyclones. The settling rate was high due to PHPA but again the sand trap could not be dumped frequently.

The formations were quite argillaceous but the sufficient amount of PHPA in the system helped in keeping the solids on lower side. The LGS increased to only 3.5 % by 1050 metres and further to 5.5 % by 1255 feet. The LGS further increased during flaxman and Eumerrella formation drilling to 7.2 % v/v.

The sand in the system was always high with values of 1.0 – 1.75 % v/v in Flaxman and Eumerrella formations.

Mud Weight

The mud weight by surface casing depth was 9.25 – 9.3 ppg (1.11-1.115 SG) because of drilled solids. Due to anticipated aquifer pressure in the Dilwyn formation, the operator requisitioned minimum mud weight of 8.9 ppg (1.07 SG).

Again due to anticipated aquifer pressure, the operator requested the mud weight of 8.9 ppg (1.07 SG) for the initial brew for production hole. The casing seat formation was not sure at that stage. KCl was utilised as the initial weighing agent.

As the LGS increased, the KCl content was allowed to drop continuously from initial 10.5 % to specified 4 %. The mud weight was increased at 1236 feet from 9.2 ppg (1.10 SG) to 9.5 ppg (1.14 SG) using Barytes on operator's request. This was requisitioned in anticipation of high-pressure sands as 25 units of drilled gas were recorded in clay stone formations.

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The mud weight further increased to 9.6-9.7 ppg (1.15 – 1.16 SG) during fast drilling through Flaxman and Eumerrella formations. No effort was made to dump and dilute the system to cut back the mud weight.

Mud Losses

No significant mud losses were experienced in the surface or production intervals. The conductor was set quite deep (67 metres) which covered the thief limestone zones. While drilling the conductor hole with water from the sump, losses were evident.

Hole Gauge

The hole on the basis of single axis calliper logs was 6.4 % overgauge with average hole size of 8.74". The Pember Mud stone, Skull Creek and Belfast Mud Stone had higher average hole sizes i.e. 9.20", 9.54" and 9.52" respectively.

Though the single axis calliper does not reflect the true picture, the lower concentration of PHPA due to mixing constraints might be a contributing factor in these argillaceous formations.

Mud System and Properties

Mud used for surface hole was basic gel spud mud. Initial gel concentration was 20 ppb, which gave the viscosity of more than 45 sec/qt in fresh make up water. The claystone of long sequence of Marl formations contributed further to mud viscosity.

SAPP addition (0.3 ppb) was added to the system at 270 metres when mud rings were experienced in Gallibrand Marl due to gumbo. Further additions of less than 0.1 ppb SAPP was made at 420 metres when a rapid viscosity increase was noticed. Mud rings were experienced after the survey at 450 metres.

During further drilling, Pac Regular and Xanthan Gum sweeps were pumped around to keep the hole clean and to increase the viscosity in Dilwyn sand formations in view of low pump discharge rate because of the single mud pump.

The running of casing was smooth though the yield point was in the range of 10 –11 lbs/100ft² only with lower gels because of sufficient polymers in the system at this stage.

KCl – PHPA Polymer mud system was used for the 8 ½" Production hole. The initial concentration of dry PHPA was 0.15 ppb, the concentration of PHPA was gradually increased to 1.0 ppb by continuous addition of PHPA during drilling.

The rate of addition was 1.35 lbs/metre of formation drilled until top of Flaxman. The average rate of addition was cut down to 0.95 lb/metre in Flaxman and Eumerrella formations due to various factors like target sands, fish eyes due to higher rheology and direct additions of PHPA.

As the concentration of PHPA was kept lower in the beginning, due to shaker constraints, so the initial concentration of Pac Reg was kept more than 1.0 ppb. The concentration was maintained between 1.25 ppb to 1.50 ppb to maintain fluid loss and rheology properties.

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When the rate of addition of PHPA was decreased near the target, Pac Reg was supplemented with Pac lv also, to have combined concentration of approximately 1.75 ppb. Xanthan Gum concentration was maintained between 0.25 to 0.4 ppb; additions more through sweeps.

As the pump discharge was expected to be low due to availability of only one mud pump (triples: 6" liner and 7" stroke length), so the yield point was kept more than 17 lbs/100ft² from the beginning itself. The yield point was 17- 23 lbs/100ft² during the drilling of 8 ½" hole though un-sheared PHPA and solids also contributed to this rheology.

Fluid loss throughout the section was less than 7.0 cc/30min and was below 6.5 cc/30min while drilling the targets.

Potassium chloride concentration was 10.5 % in the beginning of the hole as it was used as weighing agent for the starting fluid, but was allowed to decrease as the drilling progressed. The concentration was more than 4.0 % while drilling through target sands.

Due to non-availability of a pill tank, the suction tank was used as a makeshift pill tank for slugs and high viscous pills though the returns during pumping of these pills could not be isolated due to low surface capacity.