REHABILITATION OF PRODUCTION
BORR NO P24 RN 14864
ALICE SPRINGS
1989
REPORT ON REHABILITATION WORK
CARRIED OUT ON PRODUCTION BORE P24 RN14864

Background

Production bore no P24 RN14864 was drilled in the Roe Creek borefield at Alice Springs by PAWA drill rig no 16. Drilling was completed on the first of April 1987 to a total depth of 227 metres.

A 660 mm hole was drilled to 9.4 metres and cased with 508 mm casing. A 445 mm hole was drilled to 198 metres and cased to 175 metres with 406 mm casing. The 406 mm casing could not be run to the bottom of the 508 mm hole due to a slight deviation caused by the extremely fractured formation. A 311 mm hole was drilled from 198 metres to 227 metres, the hole was constructed as follows. 273 metres casing from 173.4 metres to 176.9 metres. A packer was fitted at the top of this casing to seal between it and the 406 mm surface casing. Stainless steel bore screens were set against the aquifer between 176.9 metres and 212.8 metres and 273 mm blank casing from 212.8 metres to 227 metres.

The bore was equipped by contract. During commissioning of the bore the pump and column became unscrewed at the surface and was lost down the bore.

A Darwin oilfield supply company TRI-STATE OILTOOLS were engaged to recover the lost equipment. The pump and column were recovered (photo A) however, the motor had broken from the pump on impact and was still in the bore. While recovering the pump and column the flange at the base of the pump caught beneath the 406 mm casing due to the oversize hole underneath. A very high pull was required to move the stuck pump and in doing so the bottom of the 406 mm casing was damaged. A swaging tool was manufactured by TRI-STATE to re size the damaged section of casing. While swaging was being carried out the tool unscrewed from the drill pipe and fell onto the pump motor. An overshot was manufactured by TRI-STATE to fish the swaging tool. The overshot had a 4 1/2" IF pin connection fitted internally to screw into the top of the swaging tool once the tool was located inside the overshot. Attempts to locate the swaging tool inside the overshot were unsuccessful as the swaging tool was not sitting centrally in the hole. Attempts were made to drive the overshot over the tool using heavy drill collars, this also was unsuccessful.

After considerable effort TRI-STATE abandoned their attempts at rehabilitation works. A drill rig and crew were dispatched from Darwin to carry out this work. The operations were directed and oversighed by the Drilling Superintendent.
Recovery Work

When we commenced recovery operations there remained down hole the swageing tool, below that was the pump motor, this was sitting on top of the 3 metre section of 273 mm casing which had the packer attached to it. Below the packer was 36 metres of 273 mm OD stainless steel bore screens and below the screens was 14 metres of 273 mm steel casing.

It was expected that the screens would be badly damaged and compressed due to the impact from the pump and column and the driving by TRI-STATE on the swageing tool.

On the 2nd March 1989 a down hole video camera was run in P24 by personnel from the University of New South Wales (photo B & C). A number of different lenses were used. The runs were recorded on tape.

The camera revealed the top of the swageing tool (the fish) at 178.4 metres, the shoulder of the tool joint showed some damage and the tool was seen to be leaning hard against one side of the hole. It was decided to use the overshot which was manufactured by TRI-STATE to fish the swageing tool rather than waste time manufacturing our own. The tool was despatched from Darwin. Because TRI-STATE were unable to locate the tool over the fish in its original configuration, it was decided to modify the tool and to make a wall hook to guide the fish into the overshot. The modified overshot (photo 1 & 2) was run on the 4th March, using rotation we were able to hook onto the fish but were unable to shift it.

A hook arrangement was manufactured from 38 mm dia round steel bar. The idea was to hook in behind the neck of the fish and by applying pull the fish should be forced into the centre of the hole. The hook was run on the 6th March, we were able to hook the fish as planned but when the pull was applied the hook straightened. This confirmed earlier thoughts that the fish was jammed very tightly due to the driving carried out by TRI-STATE.

On the 7th March the camera was again run, this revealed that the swageing tool had been driven down along side the motor and was hard against one side of the hole.

A tool was manufactured to position the fishing string off centre and hard against the side of the hole so it could be stabbed into the swageing tool (photo 3). A 4 1/2" IF pin connection was fitted to the bottom of this tool to screw directly into the tool joint on the swageing tool.
This offset tool was designed so that when the drill string is rotated anti-clockwise, the whole tool is rotated thus allowing it to be positioned onto fish. When the drill string is rotated clockwise, only the drill string rotates and thus allows the threaded connection which was fitted to the bottom of this offset tool, to be screwed into the fish.

This tool was run on March 9th. We were able to stab the tool joint on the fish, but due to the angle of the fish the threads pulled out when weight was applied.

The same string was then run with a tapered tap on the bottom in place of the threaded connection. The tap was screwed into the fish and the swaging tool was recovered from the hole (photo 4).

The camera was run again on the 10th March to check the position and condition of the motor. It was revealed that the motor was lying hard against the side of the hole and that the flange on top which mates to the pump was broken. It was decided to attempt to catch the motor by the remaining section of the flange as there was no section to catch onto on the flush exterior of the motor body. An overshot was manufactured from 355 mm casing with internal catchers to grab onto the flange. This tool was run on the 11th March. The overshot was positioned over the motor however the catchers were straightened out when pull was applied. This overshot was then modified (photo 5), the length was increased and the catchers were replaced with heavy spring steel sections. The modified tool was run on the 14th March, the tool was again positioned over the motor but again failed to pick it up. Further modifications were carried out and the tool was run again on the 15th March, again without success.

A new tool was manufactured from 300 mm diameter casing (photo 6) which was designed to catch the motor externally by a friction grip. This tool was run on the 16th March. The fish was engaged and the tool was driven over the fish for the required distance. When pull was applied the hoisting winch was incapable of lifting the string of tools. The kelly and hoist lines were both hooked to the string and maximum pull was applied, the tool then let go and pulled off the fish. It was now evident that the motor was jammed tightly inside the 273 mm casing, and that the string of casing and screens were wedged tightly in the hole. The force which was applied on this last tool was more than sufficient to lift the pump, casing and screens had they not been tightly jammed.
I then contacted oilfield suppliers in search of a short catch overshot which would catch onto the short drive shaft which was protruding from the top of the motor. TRI-STATE were able to source a tool from Sale Victoria, the grapples to suit were available ex Singapore. This tool was ordered on a rental basis on the 17th March. The overshot arrived on the 20th March and the grapples the following day (photo 7).

When assembling the tool it was found that the parts were not compatable and that the wrong tool had been sent from Sale. The correct tool was again ordered and arrived on the 22nd March. While waiting for the overshot a tool was manufactured in which the overshot was to be mounted. (photo 8 & 9). This tool has a wall hook to position it over the motor, centralisers were fabricated into tool to centralise motor and to guide it into the overshot. This tool was run on the 22nd March. This proved successful and the motor was recovered from the hole (photo 10 & 11). Darwin crew returned home on the 23rd March.

Work commenced again on the 15th April. A Bowen casing spear was rented to pick up the string of 273 mm casing and screens. The casing spear was run on the 15th April but could not be positioned inside the casing. The camera was run on the 16th April to inspect the top of casing, this showed that the top of the packer was damaged and the casing was lying hard against the side of the hole. This section of the hole was very fractured and much larger than the hole originally drilled.

A tapered guide was made and fitted to the casing spear (photo 12) the spear was again run in conjunction with the "offset tool" (photo 3). We were still unable to engage the casing. A "side hill" type guide was made and fitted to the casing spear (photo 13). This was still unsuccessful. A hook was manufactured to hook around the casing and position it more centrally in the hole (photo 14). This hook was run on the 21st April to centralise casing. The casing spear with the side hill guide (photo 13) was run again on the 22nd April, this time the spear was run into the casing.

When casing was pulled the top of the packer caught under the 406 mm casing because of the larger hole below. The RO300 rig which was being used to date did not have sufficient pulling power to move the casing further.

Our Bourne 2000 rig was bought in and positioned over the hole, when the additional pull of this rig was applied the spear pulled out of the casing.
The camera was again run on the 26th April. This showed the packer wedged under the 406 m casing. The casing spear was run again on the 26th, the casing was hooked and the top 3 metres were recovered. This had parted where it was joined to the screens (photo 15).

The camera was run on the 27th to check the condition of the stainless steel screens. It was decided to wash over the screens and pick them up externally with an overshot which would be made from 355 mm casing. A milling shoe with tungsten carbide particles brazed onto the cutting edge was manufactured (photo 16 & 17).

This was welded onto a 12 metre section of 355 mm casing (photo 18) which was then adapted to the drill pipe. Milling commenced but the arrangement was torquing up so badly that this method could not be continued. A hardened steel drive shoe was then made. Attempts were then made to drive the 355 mm casing over the screens but they were so badly damaged that this was unsuccessful.

A spear was made to be driven into the damaged screens by welding a series of barbs made from 38 mm round steel onto a drill collar (photo 19).

A number of mechanical problems developed with both drilling rigs during this period.

The spear was run on the 13th May and a section of the screen was recovered. The spear was repaired and run again on the 15th May and another section of screens was recovered.

Due to further mechanical problems with the rigs I returned to Darwin until repairs were carried out.

Work commenced again on the 29th June. The spear was run and another section of screen was recovered. The spear was again run, this time the rig was unable to pull string. A 50 tonne crane was ordered on the 30th June. Attempts to pull the string with the crane were unsuccessful. The rig was moved back over hole and further attempts proved successful and the last of the screens were recovered.

It was noted that when the spear was run into the 273 mm casing below the screens that the top of the casing was damaged.

A tapered reamer was manufactured and welded to the drill collar which was used to spear the screens (photo 20 & 21). This was run to re-size the casing prior to running the casing spear (photo 12).
The casing spear was then run and engaged into the casing. The casing proved to be so tightly wedged in the hole that the rig was unable to pull it.

A crane was ordered on the 6th July and the casing was lifted. The rig was then used to recover the last of the casing string.

The recovery operations were completed on the 6th July. New screens were purchased and the bore was reconstructed on the 12/8/89.

It was decided to use 355.6 mm screens in the top section of the aquifer and reduce to 273 mm screens in the bottom section of the hole. The larger diameter screens would produce a more efficient bore and the minimal additional cost was justified. It was also decided against using the 3 metre blank section of casing on top of the screens as severe corrosion was detected in the section of casing which was recovered. A material which would not promote corrosion would be required in this area, various materials including fibreglass casing were considered. It was decided to use additional stainless steel screens as this material would be strongest and most effective.

The final construction details are shown on final page of this report.

Costs

The total cost of the recovery operations, excluding hire of downhole video camera is $148,548.00. This is broken down as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost (A)</th>
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<tbody>
<tr>
<td>Recovery of swaging tool (Tri-State error)</td>
<td>19,500</td>
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<tr>
<td>Remainder of recovery operations</td>
<td>108,207</td>
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<tr>
<td>Cost of new construction</td>
<td>20,841</td>
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<tr>
<td><strong>TOTAL COST:</strong></td>
<td><strong>$148,548</strong></td>
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Additional cost of new construction is: $4,280

P. Richardson
Drilling Superintendent

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PUMP AND COLUMN RECOVERED BY TRI-STATE.

BORE HOLE INSPECTION UNIT FROM THE UNIVERSITY OF N.S.W.
MODIFIED OVERTHOT USED TO FISH FOR SWAGEING TOOL
"OFFSET TOOL" USED TO POSITION THE FISHING STRING AGAINST SIDE OF HOLE.

SWAGEING TOOL RECOVERED FROM HOLE USING "OFFSET TOOL" AND TAPERED TAP.
Overshot used to try to fish pump motor. Spring leaves were used as catchers to try to catch under flange of motor.

Another overshoot used to try to fish motor. This tool was driven over motor to catch by friction grip.
SHORT CATCH OVERSHOT (UNASSEMBLED) USED TO CATCH SHAFT ON TOP OF MOTOR.

SHORT CATCH OVERSHOT WAS FITTED INTO THIS CENTRALIZER GUIDE MADE FROM 305mm CASING.
Motor was recovered using short catch overshot mounted inside centralizer.
HOOK USED TO CENTRALIZE 273mm CASING AND SCREEN PACKER.

TOP SECTION OF 273mm CASING WITH REMAINS OF SCREEN PACKER.
MILLING SHOE USED TO TRY TO WASHOVER SCREENS.

MILLING SHOE

MILLING SHOE FITTED TO 355mm CASING
SPEAR MADE TO FISH SCREENS. 38mm DIA STEEL BARBS WERE WELDED TO 4.5 DRILL COLLAR.

TAPERED REAMER USED RESIZE BOTTOM SECTION OF 273mm CASING SOME SECTIONS OF SCREENS WERE RECOVERED FROM INSIDE CASING.
TAPERED REAMER USED TO RESIZE
273mm CASING EDGES WERE HARDFACED.