REPORT ON MORRISON
GAS WELLS
RANGELY FIELD
RIO BLANCO COUNTY, COLORADO

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Introduction

During the period September 1967 to Feb. 1, 1968, Ponka Drilling & Production Company drilled two wells in the approximate center of the Rangely oil field in Rio Blanco County, Colorado to test the oil and/or gas potential of a sand bed in the upper Morrison formation. The wells are located on a fee lease belonging to Stuart McLaughlin and were drilled on a farm-out agreement with him.

The play or prospect was initiated on the basis of isopac studies of the upper Morrison sand found in wells in the area which were drilled and completed in the Weber formation at deeper depths. The logs of these wells showed the lenticular nature of the sand, and verified its hydrocarbon potential. The attached isopac map demonstrates the erratic nature of the sand.

The first well, the Stuart #1, was located in the SE¼ SE¼, Sec. 33, T. 2N., R. 102W., and was drilled and completed between Sept. 15 and Oct. 17 of 1967. The initial production tests of the sand from 3400' to 3413' were 3.8 million cubic feet of gas per day thru 1½" choke and a flow pressure of 400 lbs. on the tubing.

The second well, the Stuart #2, was located in the SE¼ NW¼, Sec. 33, T. 2N., R. 102W., and was drilled and completed between Jan. 2 and 28, 1968. The initial production tests of the sand, 3225' to 3237', were 8.5 million cubic ft. of gas per day thru 1½" choke and a flow pressure of 350 lbs. on the tubing. This well also has production potential, estimated at 3.5 million cubic ft. of gas per day, in the Dakota formation (3020' - 3040') which is sealed behind the 5½-inch casing.

Drilling and Completion Histories

Stuart #1 Well

Location: SE¼ SE¼, Sec. 33, T. 2N., R. 102W.
471' from E-line and 866' from S-line of Sec. 33.

Elevation: D.F. 5288'

Drilling Data:

Sept. 15, 1967 - Spudded well. Set 157 ft. of $8^{5}/_{8}$", 24 lb. casing and cemented with 125 sacks cement.

Sept. 16 to Sept. 22 - Drilled from 165' to 3136 ft. with air. Dust quit at 3120 feet and had to convert to mud. Encountered top of Dakota at 3115 feet. Top of Dakota was hard, dense, Xln quartz sandstone with lots of pyrite. New bit came out of hole bald with bearings showing in 3½ hours.

Sept. 22 to Sept. 24 - Moving in mud tanks, mixing mud, and conditioning hole to continue drilling with mud.

Sept. 25 to Sept. 30 - Drilling ahead slowly. Drilled 3136' to 3395'. Lower Dakota had some oil shows. Encountered top of Cedar Mountain at about 3165'. The Buckhorn conglomerate zone appeared water wet. It was a white, coarse-grained, congl. qtz. ss. Top of Morrison was 3225 feet. Upper Morrison is composed of white bentonite beds, varicolored silty shales, white to gry., thin-bedded, very fine-grained, dense sandstones; brn. argillaceous lms. beds, with chert and pyrite. Drilled to 3395 feet and conditioned hole preparatory to running 5½-inch casing. Expected to encounter gas sand at about 3400 feet.

Sept. 30 - Ran 106 jts. of 5½", 14# casing. Landed casing at 3394 feet - D.F. Cemented casing with 70 sacks of cement.

Oct. 1 to Oct. 3 - Waiting on cement. Ran bond log. Found cement top outside casing at 3030'. Cement on inside casing at 3268'. Excellent cement bond.

Oct. 3 to Oct. 5 - Blew water out of casing with air and dried up pipe. Drilled out cement plug at bottom of casing.

Oct. 5 - Drilled ahead from 3395' to 3413'. Encountered gas sand at 3400'. Gas began to flow in large volumes. Drilled ahead to 3413 and gas volume increased steadily. Deflected gas flow thru a 2-inch line and measured volume. Gas volume measured 3.8 million cubic feet per day with a flow pressure of 400 lbs.

Oct. 6 - Left gas flow thru 3-inch and 2-inch lines for 36 hours. No apparent loss of volume or decrease in pressure. Installed bridge plug in drill pipe with McCullough wire line and stripped drill pipe out of hole thru rotating head.

Oct. 7 - Ran in 5½" Baker packer, with tubing insert plug, inside casing to 3380 ft. on McCullough line to shut-off gas flow so that blow-out preventer could be removed and tubing head installed. McCullough setting tool stuck in hole and cable parted at shive on floor. Gas was successfully shut off.

Oct. 8 to Oct. 16 - Fishing cable out of casing.

Oct. 17 - Installed tubing head with stripper rubber. Ran in 2-inch tubing. Knocked out insert plug in packer and hooked up Xmas tree, including master valves, choke valves, gauges, etc. Shut-in pressure at surface on tubing was over 1565#.

Stuart #2 Well

Location: SE¼ NW¼, Sec. 33, T. 2N., R. 102W., 6th P.M.
1978' from N-line and 2243' from W-line of Sec. 33.

Elevation: D.F. 5238 feet.

Drilling Data:

Jan. 2, 1968 - Spudded well. Drilled to 242 feet.

Jan. 3, 1968 - Set 241' of 8⅝", 24# casing and cemented with 50 sacks of cement.

Jan. 4 to Jan. 10 - Drilled 242' to 2282' with air. Encountered water in a fractured section. Decided to try mist-drilling.

Jan. 11 to Jan. 12 - Ordered in a booster and injection pump. Tried to drill ahead with mist-drilling but was unsuccessful, so decided to convert to mud.

Jan. 13 to Jan. 14 - Rigged up for mud drilling. Mixed mud with some loss-circulation material and began drilling ahead. Drilled 2282' to 2540'.

Jan. 15 to Jan. 16 - Drilled 2540' to 3047'. Encountered top of Dakota at 3020 feet. Dakota had some brown, medium grained, porous quartz sandstone with rounded grains. Good oil stain, cut and fluorescence. Decided to test this zone. Ran D.S.T. #1 from 3023 to 3047'. Had Gas to the surface immediately. Mist of saline water entered gas flow in 5 minutes. Gas flow estimated at 3½ million cubic feet. (Pressures listed below). Drilled ahead to 3111 feet.

Jan. 17 - Drilled 3111' to 3152'. Decided to log hole at this point. Ran T-E-S and gamma-sonic logs. Top of Cedar Mt. formation at 3068' and top of Morrison at 3118'. Cedar Mt. sand (Buckhorn conglomerate) looked promising on the logs, so decided to test it.

Jan. 18 - Ran D.S.T. #2 from 3100 to 3150 feet - Misrun. Packer didn't hold. Came out of hole and raised packer 35 feet and ran D.S.T. #3 from 3065' to 3150'. Had strong blow immediately and gas to the surface in 45 minutes. Est. flow of gas at 10 to 20 MCF/day. Recovered 100' of gas cut mud. (Pressures listed below).

Jan. 19 - Drilled ahead to 3218' and decided to run 5½-inch casing at this point. Expected to hit gas sand at about 3223'. Ran 102 jts. of 5½", 15# casing and cemented with 200 sks cement and 2% CaCl. Landed casing at 3212' K.B.

Jan. 20 to 22 - Waiting on cement. Ran bond log and found excellent cement bond with top of cement at 2220'. Cement top inside casing was at 3164'.

Jan. 23 to 25 - Went inside casing with 2⅞" drill pipe and 4¾" bit. Blew casing dry with air and drilled out cement plug.

Jan. 26 - Drilled ahead slowly. Encountered top of gas sand at 3225'. Had gas to the surface immediately. Large volume of gas - burnt with 60-ft. flare. Drilled ahead and volume of gas increased steadily. Drilled to 3237' and bit began to lock and drill-pipe began to torque-up. Wanted to cut 20 ft. of the sand but couldn't drill farther with present bit, so had to come out of hole. Found that drill-stem was stuck on bottom. Worked pipe for several hours without success. Called McCullough to back off drill-pipe just above bit, leaving bit and bit-sub in the hole. This was accomplished successfully, but this also allowed gas to come up drill pipe, so had to set a plug in the bottom of the drill pipe to permit coming out of hole safely. Gas volume measured 8.5 million cubic ft. per day thru 2-in line. Flow pressure was 350#. Shut-in pressure at the surface was over 1150#. Pressure would build up to 975# at the surface in 30 min.

Jan. 27 - Came out of hole with drill-pipe and closed master 5½" valve on casing. Removed blow-out preventer and installed tubing head. Ran in 2-inch tubing thru lubricator and stripper rubber. Landed tubing at 3200' and installed Xmas tree. Two further tests of the gas volume were made after 24 hours flowing. A back pressure of 700# was held on the tubing and the gas volume was measured at 3.8 million cubic feet. A back pressure of 800# was held on the tubing and the gas volume was measured at 3.12 million cubic feet.

D.S.T.'s run on Stuart #2

D.S.T. #1

Interval:	3023' - 3047' (24')
Open:	1½ hours
Shut-in:	45 minutes
Flow:	Exceptionally strongblow immediate. Had gas to the surface in 2 min. and spray of salt water in 5 min. Estimated gas volume at 3½ million cu. ft/day.
Recovery:	350' of gas-cut-water.
Pressures:	I.H.P. - 1560# I.F.P. - 1041# F.F.P. - 957# S.I.P. - 1469# F.H.P. - 1555#

D.S.T. #2

Interval:	3100' - 3150' (50')
Open:	1 minute
Remarks:	Packer failed to hold. Test was a misrun. Came out of hole and moved packer up 35 feet.

D.S.T. #3

Interval:	3065' - 3150' (85')
Open:	1½ hours
Shut-in:	1½ hours
Flow:	Strong blow immediate and holding steady thru-out test. Gas to the surface in 45 minutes. Burned with 3-ft. flare from 2-inch line. Est. 10-20 MCF/day.
Pressures:	I.H.P. - 1636# I.F.P. - 123# F.F.P. - 88# S.I.P. - 137# F.H.P. - 1642#
Recovery:	100' of gas cut mud.

Geologic Significance

It is quite evident from the successful completion of the above two wells, that a new potential productive reservoir has been discovered in the Rangely field. This reservoir sand in the upper Morrison formation has been penetrated many hundreds of times before in the development of the Weber reservoir in the Rangely field, yet there was never any tests or recorded shows which were persued by the major companies. One other well

in the area of the subject well, the #1 UPRR, was drilled by Pan American and Texaco in 1966 and completed for about 60 barrels of oil per day. The well was located on a fault and the productive sand interval 3252' to 3265 feet was very dirty and appeared to have only 5-feet of poor porosity. The production interval was, however, in the upper Morrison formation and may correlate with the production zone in the subject two wells.

The production zone in the described wells is a lenticular, irregular, and erratic fluviatile sandstone bed with variable thickness and porosity. However, this is a fairly famous productive bed in other parts of the Uinta and Piceance Basins. It produces gas and oil in the Bar-X, Cisco, Crescent Junction, and Douglas Pass areas. The attached isopac map shows the irregular outlines of the sand. The data are derived from electric logs of the Weber wells shown on the map. It is quite evident from the map that additional wells can be drilled and completed in this sand as soon as a market for the gas from the present wells is arranged.

In addition to the Upper Morrison sand, there may be a productive bed in the upper part of the Dakota formation. The first drill-stem-test taken of the upper Dakota recovered an estimated flow of about 3½ million cubic feet of gas per day along with a flow of salt water. After the logs were run and studied, it appears possible that there is a 2-ft. shale bed separating the gas and water zones. The water zone may be confined to a 6-ft. sand near the middle of the Dakota formation. A drill-stem-test of a similar zone in the Pan American #1 UPRR well also recovered gas and saline water. Thus the Dakota has certain potential productive merit in the area; but because of the possible water association, it was believed prudent to leave the formation sealed behind the casing until at a later date.

Details on the formation tops and thickness encountered in the two wells are as follows:

Stuart #1

Formation	Top	Thickness	Remarks
Mancos	Surface	3115'	
Dakota	3115'	50'	The upper Dakota was very tight and pyritic.
Cedar Mt.	3165'	60'	Conglomeratic and appeared wet.
Morrison	3225'	—	
Pay Sand	3400'	20'(?)	Pay sand is probably 20-ft thick or more.

Stuart #2

Mancos	Surface	3020'	
Dakota	3020'	48'	The upper Dakota has gas (3½ mil. cu. ft.) Saline water is also present and

Cedar Mt.	3068'	50'	may be confined to a 6-ft. sand in middle of formation. Lower section (Buckhorn Congl.) has shows and tested some gas and no water.
Morrison	3118'	—	
Pay Sand	3225'	30'(?)	Pay sand is probably 30-ft. thick or more.

The pay sand in the Stuart #1 well was found at an elevation almost identical to the #4-33 Weber well which it offset, but the pay-sand in the Stuart #2 well was encountered 15-feet higher than in the #7-33 Weber well which it offset. It is possible that the two wells are on opposite sides of a fault. Perhaps the fault was crossed at 2282' where the water in the Mancos was encountered.

Completion Method

The completion method used in the above two wells eliminated much expense usually involved in completion of gas wells. No perforating, swabbing, or sand-fracture treatment were required. The wells were completed naturally, because no damage had occurred to the productive horizon. By setting and cementing the casing just above the pay-zones and drilling-in with air, no fluids or cement were allowed to contaminate the reservoir sand. Contamination and damage to the reservoir sands are the usual reasons for having to fracture-treat the pay-zones in order to recover the original productive volume.

This type of completion, open hole and natural, requires different and slightly more elaborate control preparations than normal, but this expense is far less than the normal method of completion used by most major companies.

Conclusion

Based on studies of electric logs of Weber wells drilled in the Rangely field, it was decided that a sand lens in the Upper Morrison formation had promising productive possibilities. Accordingly, a farm-out was arranged and two wells were drilled to test the theory. Both wells were successfully completed for sizeable volumes of natural gas from the prospective sand at depths less than 3500 feet. Drilling and completion costs were minimized by using air for drilling and by using a very simple method of completion. Casing was set on top of the potential pay sand, and the pay was then penetrated using air and proper surface control equipment. No perforating, swabbing or sand-fracture treatment were thus required.

The successful completion of the subject wells near the center of the Rangely field in heretofore untested and undeveloped reservoir sands

suggests that there may be many other locations in the field where similar wells could be obtained. Further studies may also show that there are other potential productive zones in and around the field that have been missed and untested. The use of new improved drilling and completion techniques has considerable value in locating and development of additional reservoirs in old fields. Drilling fluids are often injurious to certain types of reservoir rocks and prevent successful tests or completions.

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