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GEOLOGICAL AND HISTORICAL
REPORT
ON
ROSEN NO. 2 WELL
RANGELY FIELD AREA
RIO BLANCO COUNTY, COLORADO

INTRODUCTION

The Rosen No. 2 well is located on the south flank of the Rangely Oil Field and Rangely anticline in Rio Blanco County, Colorado. The well was drilled for the purpose of testing certain oil potential zones in the Mancos formation at depths ranging from 2100 feet to 4150 feet. The specific location of the well is the NW $\frac{1}{4}$ SE $\frac{1}{4}$ of Section 11, Township 1 North, Range 102 West, 6th P.M. The elevation of the surface at the well site is 5435!

The well site for the Rosen No. 2 was selected on the basis of extensive detailed geophysical work conducted in the area for the purpose of accurately locating the faults as well as determination of positive anomalous areas which have been found to indicate certain porosity channels or trends in the Mancos shale which probably reflect littoral sediments, reef areas, sand bars, and shoreline or detrital deposits which are most favorable for hydrocarbon accumulations in the Rangely region.

DRILLING HISTORY

The Rosen No. 2 well was commenced on June 20, 1966, using rotary tools and air as a circulating medium. About 230 feet of 7-inch surface casing were set to a point below the base of the Castle-gate and a 6 $\frac{1}{4}$ -inch hole was drilled below the surface casing. The well was drilled to a depth of 2344 feet on June 25, 1966. A volume of oil was encountered at 2265 feet and returns ceased at this point. By letting the oil build up to load the hole after each joint (30 feet) of drill pipe was drilled down, it was possible to unload some of the cuttings out of the hole. This was

done for three joints, and the cuttings in the hole and oil volume in the hole caused the air pressure to rise above 225 pounds, thus preventing any further drilling in this manner. A $1\frac{1}{2}$ inch stream of oil was being blown out the end of the blooey-line for more than 2 hours when the oil was first encountered at 2265 feet. When drilling operations were continued after this, the cuttings and dust created a pasty mass which tended to plug-off the flow of oil. To continue drilling deeper at this time would have required conversion to fluid, oil and chemical, and it was believed that circulation would be most improbable due to the fractures and fault zone penetrated at about 2150 feet. Accordingly, it was decided to put the well on production at this point to determine whether or not a reasonable amount of production could be obtained from this upper zone (2265' to 2320'). There was little risk in this decision and subsequent purchase of the necessary completion equipment at this point, since all of the equipment could be salvaged and used later; and also other deeper productive zones were almost sure to be present in the well due to the good showings and development of the upper zone.

A number of directional drift surveys were run to determine the drift of the hole. The results of these surveys are listed below:

DEPTH	AM'T OF DRIFT (Degrees)	DIRECTION (Magnetic)	DIRECTION (True)
500'	3 $\frac{3}{4}$ ^o	Due N.	N. 15 ^o E.
1100'	6 $\frac{1}{2}$ ^o	N. 1 ^o W.	N. 14 ^o E.
1500'	7 $\frac{1}{2}$ ^o	N. 11 ^o E.	N. 26 ^o E.
1900'	6 ^o	N. 30 ^o E.	N. 45 ^o E.
2100'	3 ^o	N. 48 ^o E.	N. 63 ^o E.
2300'	1 ^o	N. 40 ^o W.	N. 25 ^o W.

At 2300 feet the hole is 181 feet north and 87 feet east of the surface location.

An Induction-Gamma Ray log was run on June 27 to a total depth of 2346 feet. This log clearly revealed the productive zone from 2265 to 2320 feet.

From June 27 through July 2 the well was completed and placed on production. Casing, 5½-inch, was run to a depth of 2344 feet. The bottom 60 feet (2 joints) were slotted prior to running the casing, and the casing was set on bottom and suspended from the surface. The oil level remained at about 1300 feet below the surface; so it was decided to put the well on pump without swabbing since the hole seemed to be clean and free of cuttings. Tubing, 2 7/8-inch, was run to 2295 feet, (2274.21 feet of tubing, 16.94 feet of pump barrel, and 3.0 feet of perforations), with the pump and perforated section on the bottom. The sub-structure of the rig was moved and 3/4-inch rods with the pump insert were run inside the tubing.

The tubing head was installed and the various valves and outlets required were connected. The pump jack was set and the well was placed on production on July 1, 1966; however, the pump did not operate properly, so it was necessary to pull it the next day, and one of the valves was found wedged, preventing proper action.

Initially the well began producing about 7 to 8 barrels of oil per day. This production did not seem to be commensurate with the indications while drilling, so it was decided to pull the rods and tubing and clean out the bottom of the hole with the cable tool as soon as this rig was free. Some additional drilling might also be accomplished at this time.

The cable tool rig became free on July 30 and it was moved onto the Rosen No. 2 well. The rods and tubing were pulled and the hole cleaned out to the original depth of 2346 feet. About 15 feet of fill was found in the bottom of the hole, and the well was deepened to 2359 feet (13 feet of new hole). A casing swab was rigged-up and the casing was swabbed for two days. About 40 barrels of oil were swabbed during this period; so the rods and tubing were run back into the hole; and the well put on

pump again on August 6, 1966. The well still produced only about 7 to 8 barrels of oil per day after the above work. The production remained steady at this level for ten days, so it was decided to move the rotary rig back on the location and deepen the well to the next pay zone. Accordingly on August 16, the rotary rig was set up and the rods and pump were removed from the well. The tubing and casing (5½-inch) were then pulled and the hole was blown with air. By adding another air compressor, it was possible to get some returns with normal circulation; but the amount was not sufficient to keep the hole clean. The oil coming into the hole kept the cuttings wet and sticky. Reverse circulation was then tried and was found to work satisfactorily. The hole cleaned up and 100% returns were obtained. The cuttings were dry and dusting between 2600' and 2900'. At 2907' additional oil was encountered and returns ceased for several hours. The air pressure also increased. By drilling slowly and blowing the hole, oil wet saturated cuttings could be blown-out periodically as the air pressure increased. Drilling continued slowly and it was obvious that additional thin pay zones were being penetrated. A sizeable volume of gas was encountered at 2980' along with an increase in air pressure indicating that considerable more fluid was entering the hole. A down-hole fire occurred shortly afterward and drilling ceased at 2990 feet. The drill-pipe was then pulled out of the hole. The pipe suddenly became wet (full of oil) at about 1500 feet (1500 feet of fluid in pipe) indicating that the bottom section was plugged). One more stand (60 feet) was pulled and the oil unloaded, - blowing above the derrick board. When the rest of the pipe was pulled out of the hole the bottom 3 joints of drill-pipe and 180 feet of drill-collars were plugged. A bailer was then lowered into the hole; and fluid (oil) was encountered at 700 feet below the surface. The bailer came out full of oil. The drill-pipe and collars were layed down; and 5½" casing run in the hole. The casing was landed at 2868 feet, with the 60 feet of slotted section opposite the 2265 to 2320' zone.

Since the oil level remained at about the 700-foot level, it was decided to try cleaning the hole by circulating the cuttings

out with oil. A bit and tubing (2 7/8") were run in the hole and reverse circulation with crude oil was begun. The first bridge was encountered at about 2600 feet. Cleaning and circulating of the hole continued slowly, with slow loss of oil, to 2865 feet. At this depth, circulation was lost completely and the pump pressure dropped to a few pounds. This prevented any further cleaning or drilling. About 500 barrels of oil had been lost in the hole by the cleaning operations up to this point.

Further cleaning of the hole could only be accomplished by swabbing. Swabbing began about 4:30 p.m. on August 31, and by 7:00 p.m. more than 100 barrels of oil had been swabbed and the fluid level remained at 1500 feet below the surface. The well was left standing over night and the next morning one swab was pulled and the well started flowing at a rate of approximately 15 barrels of oil per hour. It flowed at this rate for about three days and then leveled off at about 12 barrels an hour. It flowed steady for more than a week. Two 500-barrel tanks and flow lines were installed. Finally after a week the well was sufficiently steady that the swab could be removed from the tubing and the tubing head installed. A pump with hold-down slips was run on rods through an oil-saver. The tubing with the bit on the bottom is landed at 2802 feet. The well was finally put on pump on September 9, 1966 and has been pumping at a steady rate of 230 to 250 barrels of oil per day ever since.

It was impossible to run an electric log from the original total depth of 2346 feet to the new depth of 2990 feet because of the fill-up and bridge in the hole at 2600 feet. The casing was pushed through this bridge but it had to be drilled out inside the casing. The well then started flowing, precluding any further logging.

GEOLOGIC SIGNIFICANCE

The excellent production from the Rosen No. 2 well establishes the economic potential of the Mancos oil production in this area.

It also tends to prove and certainly justifies the detailed geophysical work accomplished on the prospect prior to drilling. It implies that there are several other features which were outlined in the above work on the LuBauer property which have equal potential. It should be noted that there are other potential producing zones in the Rosen No. 2 well which have not been penetrated to date, and which can supply additional production at a later date, when and if the well is deepened.

Prior to the drilling of the well, it was estimated that the hole would cross a fault at about 2100 feet. As noted above, the deviation-directional surveys taken indicate that the fault was crossed around 2150 feet. The electric log suggests that the fault might be at 2120 feet. Here again the geophysical data and well data agree very closely.

Another idea has also been substantiated by the results of the Rosen No. 2 well; namely: that the pressures and production found in virgin areas around the field are much better than in those areas where considerable drilling has already been accomplished.

It is fairly obvious from the success obtained to date in the drilling done for Rosen Oil Company at Rangely that continued drilling can result in building the production to several hundred, 500 to 1000, barrels of oil per day from the Lu Bauer block. The secret of the Mancos production is to keep drilling as long as the results are satisfactory. Of course, every well is not going to be successful; but a continued drilling program and experience obtained from each previous well will have a good chance of building sizeable production. The tremendous amount of experience which has been gathered during the past several years in this sort of production, tends to continually improve the success ratio. The length of the production period from the Mancos wells is unpredictable and varies considerably. Consequently, new wells must be drilled continually in new areas to sustain a certain production level over a long period of time.

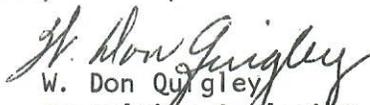
CONCLUSIONS AND RECOMMENDATIONS

The favorable results of the Rosen No. 2 well emphasizes and confirms the value of the geological and geophysical work prior to the selection of a well site. Other operators working in the Rangely area without the benefit of this type of work, seldom complete a well capable of producing sizeable quantities of oil.

As stated in the report on the Rosen No. 1 well, a drilling program of 6 or 7 wells on the Rosen - Lu Bauer block of 640 acres at Rangely could easily result in a daily production of 400 to 500 barrels of oil. Over half this amount has already been obtained in drilling the first two wells. Other anomalies on the property have an equal chance of having production. Therefore, it is recommended that a definite program to drill at least 5 more wells on the block, be planned and initiated immediately. This is particularly urgent due to the sudden interest by other property owners of lands adjacent to the 40-acre tracts under option to Rosen Oil Company from Lu Bauer Petroleum Company, since the results of the Rosen No. 2 well have become known. These other owners and operators can drill in locations and use drilling techniques which can be injurious and detrimental to the prospects on the Rosen acreage.

It is also recommended that some kind of deal, if possible, be made with the owners of the 80-acre tract ($N\frac{1}{2}SW\frac{1}{4}$ of Section 11) immediately west of the Rosen No. 2 well. This tract is now virtually proven and several other productive wells could probably be obtained on this land.

The 40 acre tract on which the Rosen No. 2 well is located has favorable locations for two or three other wells which should be drilled eventually; but the commitments on the Lu Bauer block almost require that each new well be drilled on another 40-acre tract to keep current with the requirements. The tracts on which production is found can be fully developed at a later date.


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