N.M. Oil Conservation Commission

Case 1016, Sinclair's Application for Oil-Oil Dual Completions in the Dean Pennsylvanian and Dean Devonian Pools.

by

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REPORT ON

CASE 1016,

THE APPLICATION OF SINCLAIR OIL AND GAS COMPANY FOR AN ORDER AUTHORIZING THE DUAL COMPLETION OF WELLS IN THE DEAN PENNSYLVANIAN AND DEAN DEVONIAN POOLS, LEA COUNTY, NEW MEXICO.

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ABSTRACT

A study is made of the application of Sinclair Oil and Gas Company for an order authorizing the dual completion of wells in the Dean Devonian Pool and Dean Pennsylvanian Pool, in Lea County, New Mexico.

CONCLUSION

The oil and gas reserves in the Dean Pennsylvanian Pool are such that, considering the anticipated recovery rate of 20 percent, to drill a well into the Pennsylvanian formation would be an uneconomic venture, the wells would not be drilled, and waste would occur by reason of leaving these reserves in the ground.

RECOMMENDATIONS

That an order be entered in Case 1016 granting Sinclair's application for an order authorizing the dual completion of wells in the Dean Devonian Pool and the Dean Pennsylvanian Pool in Lea County, New Mexico.

DISCUSSION:

In the consideration of any application for authorization to dually complete two oil reservoirs into a common well bore, the advantages of such a dual completion must be weighed against the disadvantages.

There are two distinct advantages to be gained by dually completing a well. The first is a matter of economics: the operator will undoubtedly save money and materials by dualling any well. The second advantage is the possibility of recovering oil from a marginal or sub-marginal reservoir that might otherwise never be tapped without the benefit of a cheap dual completion.

The disadvantages, from a conservation standpoint, of dually completing two oil reservoirs into a common well-bore are numerous, but they may be consolidated into one fundamental effect: The dual completion of any well may lead to waste of our natural resources as a result of:

1. Communication between the reservoirs resulting in the higher pressure zone bleeding pressure, oil, and/or gas into the lower pressure zone.

2. Damage to one of the producing horizons caused by the subjection of that zone to drilling mud or other medium during workover operations on the second zone.

3. Premature abandonment of a zone because of the more expensive workover operations in a dual completion which may render what otherwise might be a profitable workover into a non-profitable job which could not be performed.

4. Premature abandonment of a zone because of the inadaptability of the mechanical installation to artificial lift.

The application of Sinclair Oil and Gas Company has been considered in the light of the several advantages and disadvantages enumerated above.

Consideration of the disadvantages and the methods by which Sinclair proposes to overcome them follows:

Communication between the reservoirs: Sinclair's application provides that seven inch pipe be set through both zones and perforated into the Devonian and Pennsylvanian Pools. Although they did not so specify in their application or testimony it is presumed that cement would be circulated to a point above the top of the Pennsylvanian. This should provide adequate protection against communication outside the casing.

Applicant's proposal also provides that parallel strings of tubing be used. Separation of the two zones within the casing would be achieved by a Baker Model "D" retainer type production packer. While this packer may not be completely exempt from the possibility of leakage, it has been tried and tested for many years in oil fields throughout the United States. It is generally recognized as a dependable piece of equipment which can be relied upon to do its job. The parallel strings of tubing and the Baker packer should provide adequate protection against communication between the zones within the casing. Although the Devonian section contains a corrosive gas, the Pennsylvanian contains sweet gas and oil, and the only portion of the casing which would be exposed to corrosion would be that section opposite the Devonian and below the packer. The bottom of the packer would also be so exposed.

With respect to communication between the reservoirs, either inside the casing or outside of it, it should be pointed out that each of the two reservoirs in question has several characteristics which would make the detection of communication comparatively simple and sure:

A. The Pennsylvanian zone has an original pressure of 4008 psi. The Devonian has an original pressure of 5504psi. Any abnormal pressure variation in either or both of the reservoirs might indicate communication.

B. The gravity of the crude in the Pennsylvanian is 44^{o} API, while that of the Devonian is 35^{o} API. A change in the gravity of production from either zone would be easily detected, and a very definite indication of possible communication.

C. The Pennsylvanian zone is "sweet" whereas there is H_2S gas in the Devonian. The sudden appearance of H_2S in the Pennsylvanian production would indicate communication.

D. There is considerable difference in the gas-oil ratios of the two reservoirs. The Pennsylvanian has a GOR of 2334 to 1 while the Devonian has a GOR of 110 to 1. Any sudden change in the GOR of either reservoir would be suspicious.

Insofar as damage to one of the producing horizons by subjecting it to drilling mud or other medium during workover operations on the other zone, Sinclair's witness stated that certain types of the more simple workovers could be performed on either zone without disturbing the other zone by use of the parallel tubing strings which are proposed. The witness further stated that in the more complex types of workovers where it would be necessary to kill both zones, with the use of "proper oil-base muds with lost circulation material, if necessary, that it would be safe." The writer concurs.

No defense was offered against the objection to dual completions on the grounds that dual workovers are more expensive and may result in premature abandonment of a zone in a marginal situation where a cheaper workover might prolong the producing life, except the statement that without the dual completion, there might not be any well to work on.

Insofar as disadvantage No. 4 is concerned, the possibility of premature abandonment because of the inadaptability of the mechanical installation to artificial lift, it is the belief of Sinclair's witnesses and also that of the writer that the parallel strings of tubing, together with the high fluid levels expected in the Devonian and the high GOR's in the Pennsylvanian, that artificial lift should present no particular problems not inherent in any wells of equal depth.

Consideration of the advantages of dual completion of the Dean Pennsylvanian and the Dean Devonian Pools follows:

There is no question that the dual completion of any well rather than twinning it is more economical. Not only would a savings be effected in actual drilling costs and other intangibles, but a savings would also be realized in such tangible items as pipe, well head equipment etc.

Waste of natural resources caused by leaving the oil and gas in the ground can be averted by dual completions in the case where the development of a pool is a marginal or sub-marginal operation that might never be attempted unless the cheaper dual completions could be made rather than drill the more expensive twin wells.

Sinclair, by its testimony and exhibits, has attempted to show the Dean Pennsylvanian to be such a case. By that company's calculations 33 net feet of pay with an average porosity of 6.47 percent and a recovery rate of 20 percent will yield 1200 stock tank barrels of oil per acre, or 48,000 stock tank barrels of oil per 40-acre well. The gross value of this oil is shown to be $135,840. After the deduction of some $53,100 for royalty, taxes and operating expense, the net revenue to be gained from a twin well in the Pennsylvanian would be $82,740. The company estimates the cost of drilling the well to be $221,080, resulting in a net loss of $138,340.

With the producible reserves remaining constant, the company has further shown that after the deduction of some $57,100 for royalty, taxes and operating expenses, the net revenue to be gained from a dually completed Pennsylvanian well would be $78,740. They estimate the cost of dually completing the well to be $58,300 resulting in a net profit of $20,440.

The accuracy of these estimates of reserves and the cost of producing them appears to be reasonable enough. Several additional factors could have been considered, however, although it is doubtful if the overall picture would have been changed. No consideration was given to the value of the gas, although the Pennsylvanian gas alone would have an estimated gross value of approximately $45,000.

CONCLUSIONS

In view of all of the above-described conditions and factors, and assuming the evidence to be correct or approximately correct, the writer is of the opinion:

1. That the reserves in the Dean Pennsylvanian Pool are such that a well drilled to the Pennsylvanian formation in this pool would probably not be an economically advisable venture.

2. That the operators owning leases in the Dean Pennsylvanian Pool will in all probability not see fit to drill wells to produce the oil and gas in said pool.

3. That unless means is provided to produce the reserves in the Dean Pennsylvanian Pool by some method other than drilling wells into said Pennsylvanian formation, waste will occur in that the known reserves will not be produced.

4. That the applicant, Sinclair Oil and Gas Company, has shown that to dually complete a well in the Dean Devonian Pool and the Dean Pennsylvanian would probably be an economically feasible venture, by virtue of which the reserves in the Pennsylvanian formation could be produced and waste thereby averted.

5. That the applicant has proposed a dual completion installation utilizing parallel strings of tubing and a retainer type production packer which will provide adequate separation of the fluids from the two reservoirs within the casing, and which may be readily adapted to the artificial lifting of the fluids from the two reservoirs if and when that becomes necessary.

6. That adequate separation of the reservoirs in the well-bore outside the casing can be accomplished only by setting the production casing string at the total depth of the well bore and cementing it from total depth to a point at least 500 feet above the top of the Pennsylvanian formation.

7. That provision should be made, if applicant's proposal in Case 1016 is approved, for the Secretary-Director of the Commission to have the authority to grant administrative approval for the dual completion in the Pennsylvanian and Devonian formations only of any well located within the horizontal limits of both pools, after operator has submitted application for such dual completion in triplicate together with evidence that all operators owning leases within the horizontal limits of either or both pools have been notified of the proposed dual completion. The Secretary-Director should then wait at least 20 days before granting said administrative approval and grant same only if no objection has been received. Provision should also be made for the Secretary to have authority to grant immediate approval upon receipt of written consent to proposed dual completions by all operators owning leases within the horizontal limits of either or both pools.

8. That any well so dually completed should be completed and thereafter produced in such a manner that there will be no commingling within the well-bore, either within or outside the casing, of gas, oil and gas, or oil produced from either or both of the separate strata.

9. That upon the actual dual completion of any such well the operator should submit to the District Office of the Commission at Hobbs, New Mexico, copies of Oil Conservation Commission Form C-103, Form C-104, Form C-110 [redacted] outlining the information required on those forms by existing Rules and Regulations, and two copies of the electric log of the well. Operator should also submit in duplicate evidence indicating that the cement around the production casing string was circulated to a point at least 500 feet above the top of the Pennsylvanian formation.

10. That any well so dually completed should be equipped in such a way that reservoir pressures may be determined separately for each of the two specified strata, and further, be equipped with all necessary connections required to permit recording meters to be installed and used, at any time, as may be required by the Commission or its representatives, in order that natural gas, oil, or oil and gas from each separate stratum may be accurately measured and the gas-oil ratio thereof determined.

11. That the operator should be required to make any and all tests, including segregation tests, but not excluding other tests and/or determinations at any convenient time and in such manner as deemed necessary by the Commission; the original and all subsequent tests shall be witnessed by representatives of the Commission and by representatives of offset operators, if any there be, at their election, and the results of each test properly attested to by the applicant herein and all witnesses, and should be filed with the Commission within ten days after completion of such test.

12. That upon the actual dual completion of any such well, operator should submit to the Commission a diagrammatic sketch of the mechanical installation which was actually used to complete and produce the seal between the strata, and a special report of production, gas-oil ratio and reservoir pressure determination of each producing zone or stratum immediately following completion.

13. That any order granting approval of Sinclair's application in Case 1016 should provide that jurisdiction of that cause be retained by the Commission for such further order or orders as may seem necessary or convenient for the prevention

of waste and/or protection of correlative rights; that upon failure of any operator to comply with any requirement of the order after proper notice and hearing, the Commission could terminate the authority granted and require that operator or its successors and assigns to limit its activities to regular single-zone production in the interests of conservation insofar as the well wherein the failure to comply be concerned.