Study on the Deployment of the Transition Zone in Transition Zone in the West of Xingnan Development Zone

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Abstract. Xingnan development area in western transitional zone expansion wellblock main reservoir development, two groups, local development helped Yang reservoir, and through the test oil, was confirmed, two groups can separate a set of well pattern development, fu Yang reservoir oil intensity is low, not a single set of well pattern development. In this paper, the saltu oil layer and the fuyang oil layer are composed of a series of layers. Due to salt figure reservoir and Yang oil layer are different, in terms of well pattern deployment, the practice of commingled production, cannot continue to use the original Mr Portugal in xingnan development area in western transitional zone expansion pattern of series of strata combination, injection-production well spacing and well spacing are studied.

1. External expansion pattern deployment
The main developing area of the western transitional zone in the west of apricot zone is the oil layer of the two groups, the local development of the support Yang oil layer, and the formation of the oil layers and the three groups of oil layers. Judging from the economic evaluation results, the internal rate of yield of a series of strata mining is more than 12%, which meets the requirements of economic evaluation index. Fu Yang reservoir poor reservoir physical property and oil content, low strength of produced liquid, effective testing oil intensity is 0.19 t/d. m, predicting favorable area average single well development, effective thickness of 8.0 m, according to try oil strength calculation average single well oil Nissan oil is about 1.5 t, the actual production, Nissan oil is about 0.8 t. Thanks to help Yang reservoir buried depth, high development cost, poor reservoir property, low output, the understanding and development of technology is not mature, therefore the outside enlarge well spacing development series of strata with sa group 2 reservoir is given priority to, fu Yang reservoir is not as the development of this set of pattern formation, but to make sense of fu Yang oil layer and the feasibility of the two groups reservoir commingled production, choose the small block in fu Yang reservoir development area of deepening drilling, in order to carry out fu Yang reservoir development feasibility test.

1.1. The determination of injection-interval spacing
Consider from the saltu oil layer: Indoor experimental results show that the calcium, and untabulated reservoir of low permeability reservoir seepage flow there exists start-up pressure gradient, measuring water from different permeability core of start-up pressure gradient curve can be seen that: when the...
reservoir permeability decreased to $5 \times 10^{-3} \mu m^2$, start-up pressure gradient increasing. When reservoir permeability is greater than $5 \times 10^{-3} \mu m^2$, the starting pressure gradient change is small. It is considered that the oil layer of the fuyang reservoir is the rectangular well network, the fracture direction is parallel to the direction of the well row, and the better economic effect can be obtained through the linear water injection. The advantages are: firstly, the well spacing is smaller, which is beneficial to the water injection. The second is to expand waterflood sweep volume and improve oil recovery rate. Well spacing: according to the prediction result of seismic sand body, the well spacing should be controlled within 300m in order to effectively control the sand body. Distance: the maximum well spacing is 300m, the limit is 150m, and the limit is about 170m. The expansion well is based on the sa-2 group, taking into account the support of the poplar oil layer, and the distance of the outer spreading well limits should not exceed 170m.

1.2. Well drainage direction

The direction of the outspread well spacing is considered: one is to have good connection with the old well; the second is to try to meet the oil layer characteristics.

From the Portuguese reservoir considering: the original 104.5 network north east direction, new well drainage according to the direction of north east 104.5 is better.

Taking into account of the oil layer in the fuyang, the fracture monitoring results in the peripheral oil fields and the high taizi oil fields in daqing are based on the orientation of the fracture system and the orientation of the stress field of the main ground. Extra low permeability reservoirs of artificial and natural cracks, common caused the reservoir plane heterogeneity, natural fracture due to under the condition of the formation is closed, its permeability is low, and artificial support fracture permeability can reach several darcy, on the ability of reservoir seepage control effect of artificial fracture, mainly as a result, low permeability reservoir of well pattern configuration and optimization of main conforms to the development direction of the artificial fracture.

| Table 1-1 The ratio of the pattern and permeability of different well networks is affected |
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| The crack and the well Angle(°) | $k_x/k_y$ | Waterflood mode | 1.5 | 2 | 3 | 4 | 5 | 6 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A=0° | Five points | 0.79 | 0.72 | 0.629 | 0.57 | 0.53 | 0.499 |
| | Seven points | 0.711 | 0.646 | 0.564 | 0.513 | 0.476 | 0.448 |
| | Inverse nine points | 0.508 | 0.462 | 0.404 | 0.367 | 0.34 | 0.32 |
| A=22.5° | Five points | 0.66 | 0.603 | 0.526 | 0.478 | 0.444 | 0.48 |
| | Seven points | 0.65 | 0.59 | 0.516 | 0.469 | 0.385 | 0.409 |
| | Inverse nine points | 0.535 | 0.486 | 0.425 | 0.386 | 0.359 | 0.337 |
| A=45° | Five points | 0.629 | 0.57 | 0.499 | 0.453 | 0.421 | 0.396 |
| | Seven points | 0.66 | 0.60 | 0.525 | 0.477 | 0.443 | 0.414 |
| | Inverse nine points | 0.64 | 0.582 | 0.508 | 0.461 | 0.428 | 0.404 |

Well array xingnan development area in western transitional zone, transition zone of the west apricot 13 - butyl 2-115 crack monitoring results for north east 50.4 ~ 68.9 degree, consider fu Yang reservoir well spacing direction parallel to the direction of crack as far as possible, at the same time, considering the original first drilling Wells development direction, benefit for the deployment of the well pattern, well array fu Yang favourable reservoir area by north east 58.0 degree; Fu Yang oil layer not deepen well array area still USES the original well pattern, 104.5 degree for north east direction.
1.3. Good selection of the well scheme

1.3.1. Pattern contrast. Scheme 1: according to the well distance of 200m, the line is 112m, and the well is evenly distributed, and the water injection well network of 150m five-point method is used. Advantage: the well spacing of injection-production well is well connected with the internal well meshes, and the well is more effective. Disadvantages: the number of injection-production Wells is 1:1, and the injection well is more than one. Plan 2: according to the well distance of 200m, the line is 112m, and the injection-production well is evenly distributed from 150m to the outside, one or three drainage Wells, two drainage Wells, and four oil and oil Wells. In the later stage of the high water-cut period, the same well network was developed with scheme 1. Advantages: well connected with internal well meshwork, the number of injection-production well is 1: 1.7, and the later adjustment is big. Disadvantages: detention area. Solution 3: according to the spacing of 100 m, is apart from the 150 m, outward uniform well spacing, cloth to a row of oil Wells, a row of linear water injection well. The injection-recovery well is 150m. Advantage: the ratio of injection-production well is 1:1. The paper is well connected with internal well meshwork. Disadvantages: the number of Wells is small, the water injection well is more, and the later adjustment of the well is small, and the injection-well spacing is not uniform.

1.3.2. A numerical simulation is applied to optimize the design of the well. Comprehensive analysis of the above three sets of well spacing, the results from numerical simulation, highest plan 2 and recovery, and modest. Look from the investment scheme 2 late need well focus needs to increase investment. But from a technical and economic indicators 2 analysis scheme for the optimal solution. Scheme 2 has the following advantages. Production management: the injection well spacing is even. Initial oil production speed is high. The water injection water injection well is easy to manage. Late adjustment is big. Economic indicators: scheme 2 due to oil Wells more early, early high oil recovery rate, investment payback period of less than 2.89 years plan 1, completely can make up for the late transfer increases the cost of oil Wells. Have good economic benefit. The preferred method for the above reason 2 for recommendation.

2. Development index prediction and economic evaluation

On the basis of the development index prediction, the results of the proposed buwell in the western transitional zone of a block are evaluated. The economic evaluation parameters are as follows:

- Drilling cost 833 yuan/meter; there is no shallow gas and living water in the outer expansion area.
- Operating cost: 634.72 yuan/ton; Logging 75,000 yuan/mouth; The cost of single well fracturing is 35.29 million yuan; The construction cost of the ground is RMB 600,000 per unit; Income tax is 25%, VAT 17%, resource tax is 30 yuan/ton, city construction tax 7%, education surcharge 3%; Interest rate is RMB 6.8 per dollar and the evaluation period is 10 years.

According to the development of the first drilling and regulating reservoir well drilling in fuyang reservoir conditions, in combination with well-developed and well data, design the drilling deep drilling into 2 group at the end of 251 Wells, an average of 1170 m deep well, single well cost is 2.0025 million yuan; The drilling deep drilling by the end of Portuguese 1 group of 289 Wells, an average of 1270 m deep well, cost is 2.0858 million yuan. When evaluating $40, the after-tax internal rate of return is 12.45%, the investment margin is 3.67%, and the after-tax investment recovery period is 4.62 years, which has a good economic benefit.

3. Conclusions

1) One block west of transitional zone expanding main oil producing area for the two groups reservoir, so the outside enlarge well spacing is given priority to with, two groups, both helped Yang oil layer, and therefore outside enlarge well spacing to determine the injection-production well spacing is 150 m.
2) Outside enlarge western region well array adopted different: fu Yang oil layer not deepen well array area still USES the original well pattern, 104.5 degree for north east direction; The support of Yang - Yang oil layer has a different direction.

3) This time, the well of the well, the three drainage Wells, the two drainage Wells, the four oil Wells and the inter-water injection Wells, and the later stage of the high water-cut period is converted into a linear injection well network mining.

Acknowledgements
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