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Application of Eclipse Numerical Simulation Technology in H Block

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Abstract: The J area of H oil field belongs to low permeability oilfield, in order to provide technical services for water flooding development plan optimization. According to the geological survey of H numerical simulation software, a numerical simulation is carried out on the block by ECLIPSE reservoir. According to the geological parameters, need to enter the reservoir model dynamic development data, established the three-dimensional geological model of phase control. Based on eclipse numerical simulation software team h block geological reserves and the small layer geological reserves were fitted, and combination of injection well and production well production dynamic data of water flooding history matching. According to the fitting results, we can see that the region's water content and oil production capacity and actual production dynamic data, compared with the control in the reasonable range of relative error. By reproducing the development course of reservoir, anglicizing h well zone development present situation, and finding the problems existed in the well area, lay a solid foundation in the later period of oilfield development adjustment scheme for the later development of a series of work do the preparatory work for the full and play a guide role for the future adjustment of oilfield development.

Key words: *Oil deposit; Geologic reserve; Numerical simulation technology; History match;*

I. INTRODUCTION

Reservoir numerical simulation technology has developed a relatively mature technology since the 1950s. In oil field development plan and determination, the adjustment and optimization of production measures in oil field exploitation and improve reservoir recovery factor, has gradually become a kind of indispensable main research methods. Technology of reservoir numerical simulation has a big improvement after decades of research, and closed to the actual situation of oilfield development and production increasingly. Reservoir numerical simulation technology with the application in oilfield development and production, and according to the research of reservoir engineering and the demand of the reservoir engineer, continuously to the development of high-level and multidisciplinary combination, it will get continuous development and perfection and presents some new characteristics.

II. H BLOCK GEOLOGICAL SURVEY

H block began to produce in 2009 with the method of line flood. It located in Fu Yu oil layer, top surface depth is about 1740m, statistical block average drilling in sandstone thickness is 17.6m, and effective thickness is 8.1m. The types of sand body are mainly made of channel sand and distribute zonally. The depositional environment of fu-1 layer and fu-2 layer is deposit of intrafacies of shunting plain of delta which gives priority to with channel sand, the types of sedimentary context are mainly typical positive cycle of high small bending distributary channel, crevasse channel, straight channel, crevasse splay, underwater distributary channel and other sedimentary sand bodies, the minority is lice in the rivers.

III. THE ESTABLISHMENT OF THE NUMERICAL SIMULATION MODEL

2.1 Numerical simulation of basic parameters

According to the actual situation of the study blocks, the initial model need to input parameters including the reservoir fluid model parameters, physical parameters of fluid and physical parameters of rock before simulating with the ECLIPSE software. Reservoir fluid model parameters include water saturation, fluid pressure and so on. Fluid physical parameters include fluid density, viscosity, volume factor and the compression coefficient. Petrophysical parameters mainly refer to the compressibility of rock. Model the initial input of the basic parameters are shown in table 1.

Table 1 Model basic parameter

Parameters	value
Density of water/（g·cm^{-3}）	1
Viscosity of water /（mPa·s）	0.5
Density of the crude oil /（g·cm^{-3}）	0.8686
Viscosity of crude /（mPa·s）	6
Initial formation pressure /（MPa）	26.1
Water volume factor	1
Crude oil volume factor	1.069
Water compressibility /MPa^{-1}	4.4×10^{-4}
Crude oil compressibility /MPa^{-1}	9.3×10^{-4}
The rock compressibility /MPa^{-1}	6×10^{-4}

2.2 Geological reserves fitting

The first step in the history matching is the fitting of geological reserve. Geological reserve of simulation block original is 104.07×10^{4}t. Geological reserve of calculation model is 108.87×10^{4}t.Fitting fractional error is 4.6%. And fit for the layered reserves on the basis of each small layers actual geological reserve. Layered reserves fitting results are shown in table 2.

Table 2 Fitting results of stratified reserves

Layered number	Layered reserves（10^{4}t）
1	1.50
2	0.79
3	2.14
4	3.59
5	0.23
6	1.70
7	1.01
8	9.67
9	4.38
10	2.35
11	10.43
12	6.78
13	34.61
14	2.02
15	5.15
16	5.58
17	1.71
18	3.71
19	1.44
20	3.57
21	1.07
22	0.55

23	1.77
24	1.80
25	1.30
SUM	108.87

2.3 Dynamic history matching

To carry on the dynamic history matching, the H block fitting until October 2014, the actual composite water cut is 78.60%, the composite water cut of model calculation is 78.30% and fractional error is 2.2%. The actual cumulative fluid production volume is 12.87×10^4t. The calculated result is 12.92×10^4t, Fitting fractional error is 0.37%. Oil production rate, fluid production rate and average water cut in the whole block are showed in Fig.1 to Fig.3.

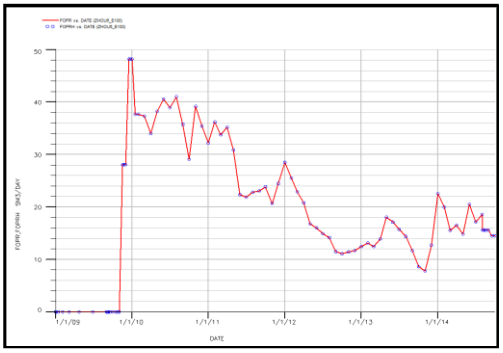

Fig.1 Oil production rate matched curve

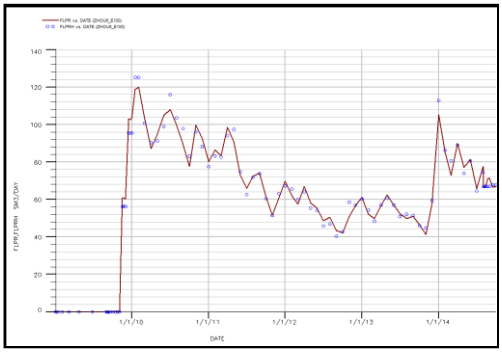

Fig.2 Fluid production rate matched curve

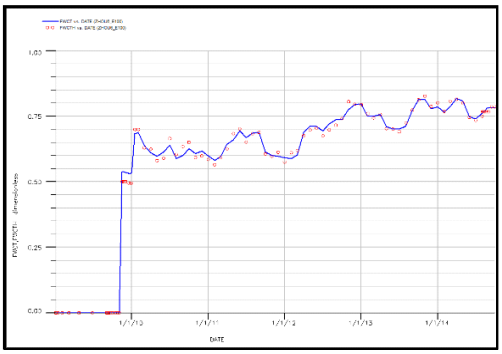

Fig.3 Average water cut matched curve

IV. CONCLUSION

1）H block 3D phased geological model is established. Geological reserve of simulation block original is 104.07×10^4t. Geological reserve of calculation model is 108.87×10^4t. It product the geological reserve and dynamic history fitting and conform to the precision requirement of the numerical simulation.

2）Longitudinal residual oil of H block is mainly distributed in the layer of F171, F142 and F121 layer.

3）Major reservoir with high degree, remaining oil saturation is relatively low, but the remaining reserves are still high, the new method for mining the main object. The pay-gross thickness ratio of major reservoir is high and remainder oil saturation is relatively low, but remaining reserves is still high and major reservoir is the main object for the new method of mining.

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