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Research Paper

The Distribution Model of the Sand Body in the Front Facies of Zhaozhou Oilfield

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ABSTRACT: *This paper took the Zhou 6 close well spacings as the research area. The study area is located in Zhaozhou oilfield, where the delta front sand and sheet sand are widely developed, the thickness is thinner and the thin interbed develops, and the sand body changes fast in the lateral direction. We usually rely on the experience of the individual and the subjective knowledge, apply the traditional pattern method drawing to carry on the trace of the river channel, the boundary characterization, the prediction of the sand body in the well is very difficult. With the deepening of the development phase, the results can't satisfy the demand of encryption adjustment and fine tapping potential of water flooding. Therefore, quantitative description of channel boundaries and accurate prediction of sand bodies between wells have become a problem for quantitative description of sand bodies in the front facies. In this study's dense well pattern area, the single sand body was dissected by using the existing information, the single sand body type and its superposition model were explored. The sedimentary model of single sand body of underwater distributary channel was established, and the single sand body type and its superposition model were explored.*
Keywords*: Frontal facies, Single sandbody distribution model, Single sand body type, Songliao Basin*

I. INTRODUCTION

Usually delta distributary leaves that formed in the same period and the same distributary system are defined as single sandbody of frontal facies reservoir, or sand body framework (River) is not continuous completely and appear a large area of sheet sand[1-2]. At present, we have not studied the distribution model of sand bodies in front of Zhaozhou Oilfield, only by carrying out intensive and meticulous geological research can we meet the need for deep tapping of oil reservoirs. Therefore, it is necessary to study the single sand bodies of the leading edge.

The Zhou 6 close well spacings is located in Zhaozhou oilfield, where the delta front sand and sheet sand are widely developed[3-6], the thickness is thinner and the thin interbed develops, and the sand body changes fast in the lateral direction. We usually rely on the experience of the individual and the subjective knowledge, apply the traditional pattern method drawing to carry on the trace of the river channel, the boundary characterization, the prediction of the sand body in the well is very difficult. With the deepening of the development phase, the results can't satisfy the demand of encryption adjustment and fine tapping potential of water flooding. Therefore, quantitative description of channel boundaries and accurate prediction of sand bodies between wells have become a problem for quantitative description of sand bodies in the front facies. In this study's dense well pattern area, the single sand body was dissected by using the existing information, the single sand body type and its superposition model were explored. The sedimentary model of single sand body of underwater distributary channel was established, and the single sand body type and its superposition model were explored.

II. SINGLE SANDBODY DISTRIBUTION MODEL IN FRONTAL FACIES RESERVOIR

Through the study of modern sedimentary deposits, such as Songhua River and Poyang Lake, combined with the previous sedimentary background of this area (belongs to shallow water lake delta front facies sedimentary), the single sand body genetic model of delta front, underwater distributary and frontal sheet sand was set up [7-9], the distribution characteristics and plane combination models of different types of single

sand bodies were defined, the sedimentary model was provided for inter well prediction of various types of single sand bodies.

2.2 Sedimentary model of underwater distributary channel

In the study area, the delta type of P1 group belonged to the branch delta sedimentary type, which was a constructive delta deposit, with shallow lake water and weak lake wave, and lake river function stronger[7,10]. Therefore, the estuary dam was not developed, and the underwater distributary channel was relatively developed, becoming the framework sand body of the delta front.

There was also a certain difference between the types of underwater distributary channels in different positions and under different hydrodynamic conditions. Through the investigation of modern sedimentary investigation, the sedimentary model of distributary channel has been studied by using the method of "research on ancient times", which mainly consists of four sedimentary models.

(1) Branched distributary channel model

This type of river energy was strong and dominated by river control, which was located in the coastal position, distributary channel gradually bifurcated from upstream to downstream, and the confluence is less.

From the study of the anatomical results of dense well pattern, the P I51, 52 and 6 belonged to this type. For example, PI6, the number of channels from 1-2-6 in turn increased, river width 464.2-257.3-177.1-92.9m narrowed in turn. The thickness of the channel ranged from about 2m to about 1m of the end, which was very similar to that of modern sedimentation. This model belonged to the main distribution type of distributary channel in shallow lake basin (Figure 1.1).

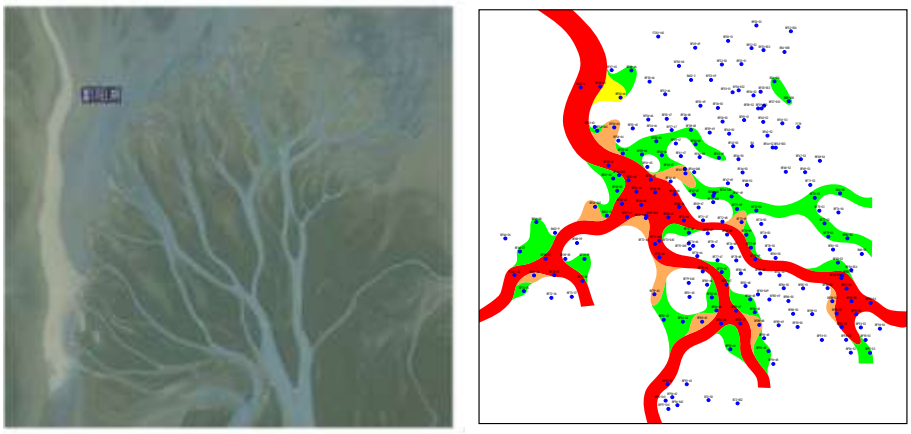

Fig. 1.1 Bifurcated distributary channel model

(2) Interlaced network distributary channel model

The river energy was strong and dominated by river control, which was located in the middle bank position, distributary channel gradually bifurcated and merged from upstream to downstream river, interwoven into a network pattern. The PI42 belonged to this kind of sedimentary model, but the formation mechanism was the same although there were partial distributary channel deposits. Channel run continuous bifurcated and merged, some rivers were wide and some were narrow, in the combined channel width increased, crotch width is narrow, the overall morphology was very similar to that of modern deposits. Most of them are developed in the middle channel, and this model is also an important development pattern of distributary channel of distributary channel in shallow lake basin (Figure 1.2).

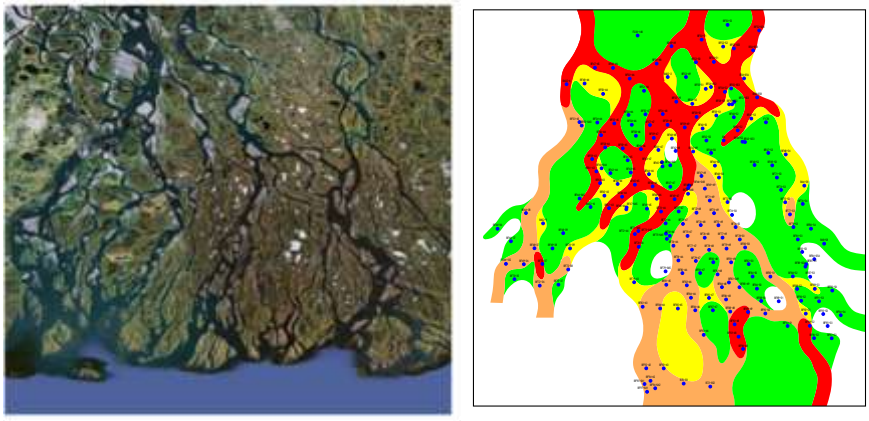

Fig. 1.2 Interlaced network distributary channel model

(3) Single continuous distributary channel model

This type channel more developed in where provenance supplied less. The energy of the river was relatively weakened, the lake wave action was relatively enhanced, the channel size was small, the distributary channel development type was unitary, the bifurcation and the merger were few, but the river channel was continuously distributed. PI41 belonged to this sedimentary model in the study area. An underwater distributary channel was developed in the west of the study area. The channel was continuous, and a large area of thin layer of sand was developed on the flank of the channel. It showed that the transformation of lake water was enhanced, and the sand bodies brought by rivers were transformed into sheeted thin sand bodies (Figure 1.3).

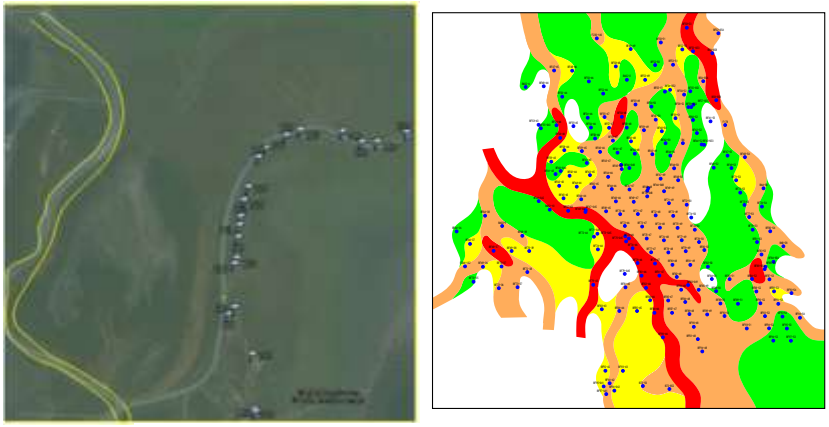

Fig. 1.3 Single continuous distributary channel model

(4) Isolated intermittent distributary channel model

This type of channel mostly develops in the mid shore delta, the transitional position of the Delta Inner and outer front. Due to the enhancement of water transformation, the sand body of many rivers was transformed into thin sheet sand, river sand was also the original location level. The residual sediments in the channel can be seen only in the deeper part of the cut, resulting in the whole shape of the river channel is intermittent and pod shaped, and the continuity is worse than that of the former. The PI22 belonged to this kind of sedimentary model. In the north, there were two rivers disappeared in the middle part, appeared occasionally in the southern part of the region. The direction of the original channel could be seen from the extension direction of the main thin layer sand, but the channel boundary was no longer clear after the Lake wave transformation (Figure 1.4).

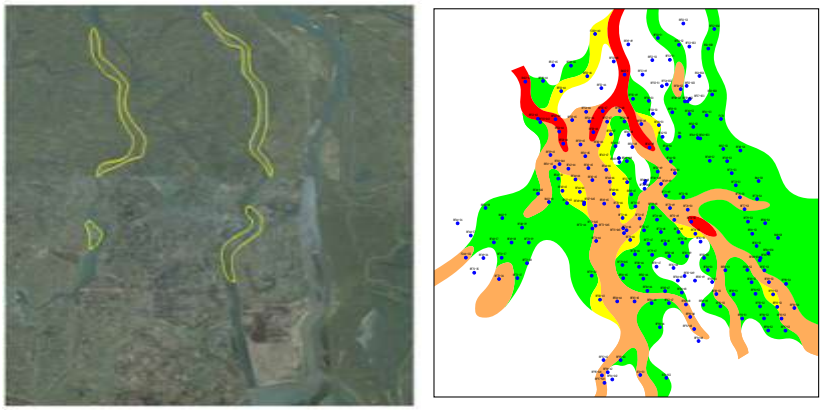

Fig. 1.4 Isolated intermittent distributary channel model

2.3 The sedimentary model of thin sheet sand in frontal phase

The frontal sand sheet is another major sand body in the delta front sedimentary environment. For the dendritic constructive delta, the leading edge sand bodies have strong fluvial characteristics. That is to say, its origin is closely related to underwater distributary channel. According to its specific cause of formation mechanism, it can be divided into three main categories, each of which can be further subdivided into 2-3 types[12].

(1) Side overflow sheeted sand pattern (overland and overflow)

For side overflow sheeted sand bodies, from the point of origin, the water level of the flood stage is higher than

the embankment, the river water crosses the embankment, the suspended sand body carried in the water is deposited on both sides of the embankment to form the sand body of the flaky distribution. The distribution area is small, and the ear shape is in the edge of the river. It is called the overland sand. If the lake wave reconstruct the sand body, the distribution area of the sand body will increase, thus forming a large distribution of the sand body, which is called diffuse sand. For the overland sand, generally parallel development of the channel, the grain size is fine, the ear shape or the nepotism are distributed, divided into the single overflow bank and the multiple overflows, and the overland sand is the natural caustic sand body. Diffused sand is generally distributed in the channel between the channels. Such as modern sedimentation, the sand bodies formed at the edges of the branches of two rivers. From the study area, the picture on the left belongs to the overflow sand, with a small distribution area and a marginal distribution along the river course, the right picture belongs to the overflow sand body in the river between the large area of sheet distribution (Figure 1.5).

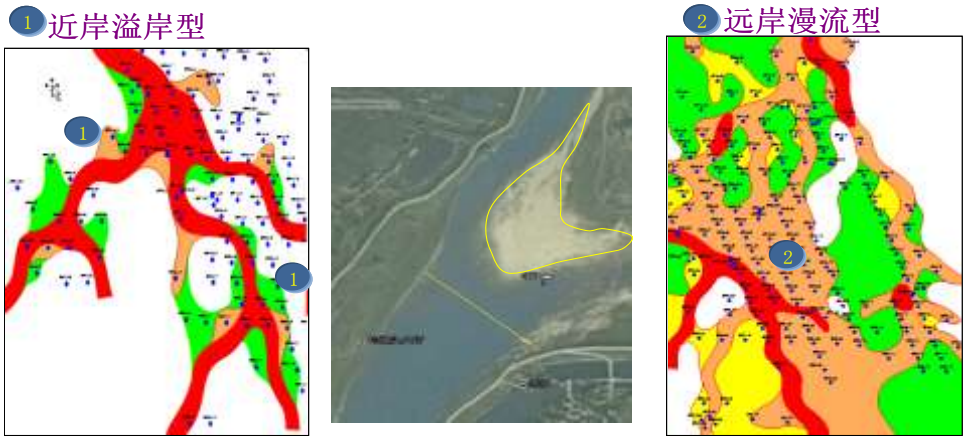

Fig. 1.5 Side overflow type sand sheet mode (overflow, overflow)

(2) Burst type sand sheet model (burst, channel)

For the class of crevasse sheet sand model, from the point of origin, when the water level of the flood period is higher than the embankment, the river runs out of the river bank and forms a gap on one side of the river bank to form a small waterway. The river has been divided repeatedly, and the sediment of the river is deposited on both sides of the channel and the water channel form a scalloping sand body, which we call the decile sheet sand. According to the distribution pattern of sand bodies, it can be further refined into many types. If the distribution pattern of the sand body is a fan, we call it the final fan, if it is a single channel band distribution deposition, we call it the crevasse channel. If this crevasse channel confluence with another channel, it is often said that the channel bypass deposit. From the relationship with the channel combination, generally skew with river, mostly occurre in the river bank. Morphologically, it is generally banded, bifurcated, branched, or fan-shaped. From the grain size, because the sediment contains not only suspended components, but also a part of rolling components, it is slightly thicker than the overflow sand deposits. As modern sedimentary, at the side of the river formed a crevasse channel deposition, the channel forks several times at the end. From the study area, the picture on the left below belongs to single crevasse channel, above belongs to the multi branched crevasse channel, the right picture below belongs to the channel deposition, distribution of the river bridge (Figure 1.6).

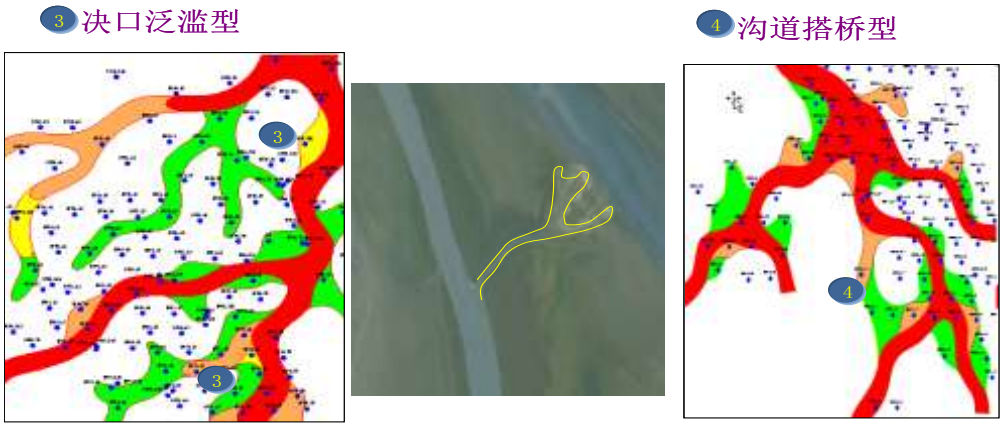

Fig. 1.6 Burst type sand sheet model (burst, channel)

(3) Terminal sheet sand model (inertial strip, inertial film flow)

For terminal sheet sand model, from the point of origin, as the energy of the river gradually weakens, the sand bodies brought by the river are deposited at a distance from the end of the channel under the action of inertia. This type of sand body is called terminal sheet sand. According to the distribution pattern of sand bodies, they can be further refined into two types. If the sand bodies at the end of the channel are distributed in a strip, they are called inertial strip sand, and if they are distributed in sheets at the end of the channel, they are called inertial film sand. This type of sand body facies mostly develops in the constructive delta. Such as modern deposition, in the end of the channel sand body is spread sheet, belonging to the inertial flow, from the study area, the sand in the left picture is a distribution of sand at the end of the river, and belongs to the inertial sheet flow sand body, the sand in the right picture is a strip distribution at the end of the river, which is an inertial strip sand body (Figure 1.7).

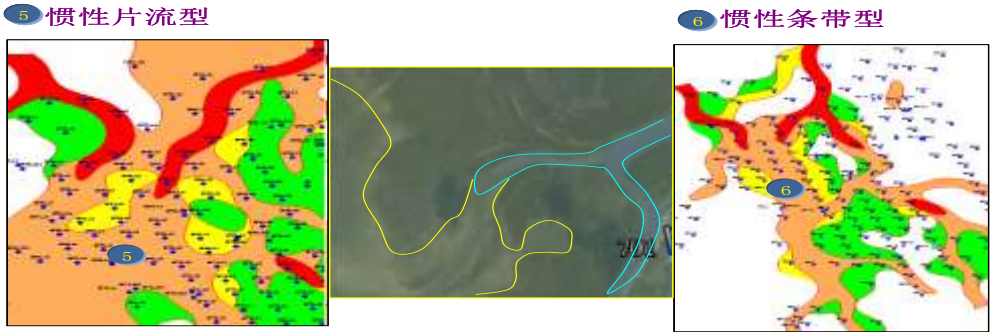

Fig. 1.7 Terminal sheet sand model (inertial strip, inertial film flow)

In short through the establishment of distribution patterns of delta, underwater distributary channel and front sheet sand body single genetic sand body model, it has deepened the understanding of the distribution and genesis of the delta front sand bodies, and laid a foundation for the identification of the single sandbody in the frontal facies reservoir and the heterogeneity of the reservoir.

III. CONCLUSION

Through This Research, The Following Conclusions And Understanding Are Obtained.

1. The distribution patterns of single sand body in four kinds of underwater distributary channels were established, which were "branched branching, interwoven network, single continuous type, residual intermittent type". The distribution pattern of 6 kinds of leading edge sheet sand bodies is established, which were shore overshore type, far shore diffusing type, type of runoff type, channel bypass type, inertial laminar flow type, and inertia band type.
2. The frontal facies reservoir could be divided into "branch" underwater distributary channel sand body, "branch network" frontal sheet sand body two types of sand body, "dendritic, mesh, sheet" three plane structure model.

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