JIN Chengzhi, XU Chengwu and GAO Chunwen, 2015. Heterogenetic CBM Sweet Spots Evaluation Methods of Faulted Basin. *Acta Geologica Sinica* (English Edition), 89(supp.): 45-47.

Heterogenetic CBM Sweet Spots Evaluation Methods of Faulted Basin

JIN Chengzhi[1], XU Chengwu[2, 3, *] and GAO Chunwen[1]

1 *Daqing Oilfield Company Limited, Daqing City, Heilongjiang Province, 163712*
2 *Daqing Oilfield Exploration and Development Research Institute, Daqing City, Heilongjiang Province, 163712*
3 *Northeast Petroleum University, Daqing City, Heilongjiang Province, 163318*

1 Introduction

The Jixi basin is a Mesozoic and Cenozoic rift coal basin in Jiamusi uplift.The recent coal bed gas in Jixi basin shows that the coal bed methane resources prospect is good, and the resources potential is large (TANG Shuheng, 2000;Zhang Xinmin, 2002).However, it is in the face of the problems such as narrow zone of sedimentary facies, rapid phase transformation, thin coal seam, coal distribution of poor continuity and fault development. The research on the coal bed gas system is not carried out. Coalbed methane reservoir often only distributed in the basin is very limited site (Qin et al, 2012). Therefore, the establishment of correct selection method is the important foundation and key factors of the exploration and development of coalbed gas successfully.

2 Main Controlling Factors and Optimization of Zone

The coal bed gas is the self generation and self preservation reservoir. The source of the reservoir, the gas generation and preservation are controlled by the coal bed itself. From generation analysis, Jixi Basin coalbed methane isotope mainly distributed between 39% to 41%, coal seam mature degree between 0.7% to 1.7%. The genesis of coalbed gas is thermogenic gas. So coal seam thickness and maturity are the main control factors of gas generation quantity. From the point of view of reservoir analysis, coal bed industry analysis and isothermal adsorption experiments show that the main coal ash content of Jixi basin is low, generally lower than 10% (Table 1). The coal bed has good adsorption capacity. Meanwhile, the adsorption capacity of the coal seam increases with the maturity of the coal seam, and the high maturity coal seam has a greater reservoir capacity (Su Xianbo, 2001).In summary, coal maturity and reservoir thickness are key factors of coalbed gas enrichment reservoir. From the perspective of preservation, the coal seam roof in Jixi basin is dominated by the silt and mudstone, the lithology is dense and the sealing ability is good. However, the structure of the basin is relatively complex. The structural stability is the key factor for the preservation of CBM. In summary, thickness, maturity and structural stability are the main controlling factors of favorable zone. Coal seam thickness statistics analysis of Chengzihe formation in Jixi basin by more than 100 wells showed that, the thickness of coal seam varies greatly. Didao-Chengzihe and Pinggang-Hezuo zone in Jixi Basin are mainly coal accumulating area.

More than 50 Chengzihe formation maturity data statistical analysis showed that regional variation of the Chengzihe formation maturity in Jixi basin is large. There are four high mature zones in Jixi basin, Mashan, Donghai, Heitai, Pinggang(Fig1). Within the area of tectonic stability zone of Ping-gang Di-dao, the maturity and the thickness of overlapped areas, are favorable areas for coalbed gas zone;

3 Main Controlling Factors and Optimization of Layers

The analysis of the well in the favourable zone shows that the accumulated thickness of the coal seam can reach 60m above. But the single layer is thin, the maximum thickness of the single layer is generally no more than 3m, most coal seam 1-2m.The longitudinal span of the coal seam is large, from the buried depth from the 1400m to the 400m. It is relative dispersion.

To solve this problem, it is used well logging and mud logging data in the favourable areas of major coal bed Chengzihe formation and Muling formations to carry out fine contrast. Muling formation can be divided into 3

* Corresponding author. E-mail: 2868915@ qq.com

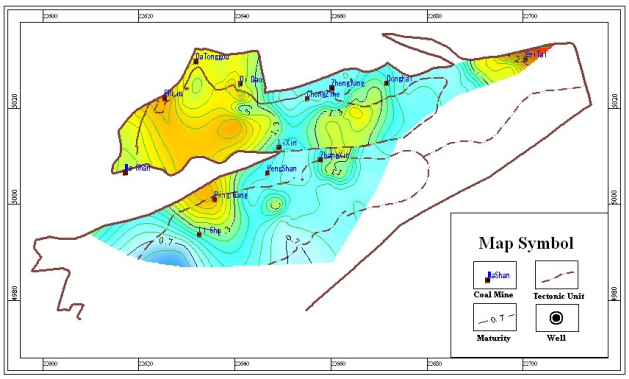

Fig. 1. maturity contours map of Chengzihe formation coal seam in Jixi Basin

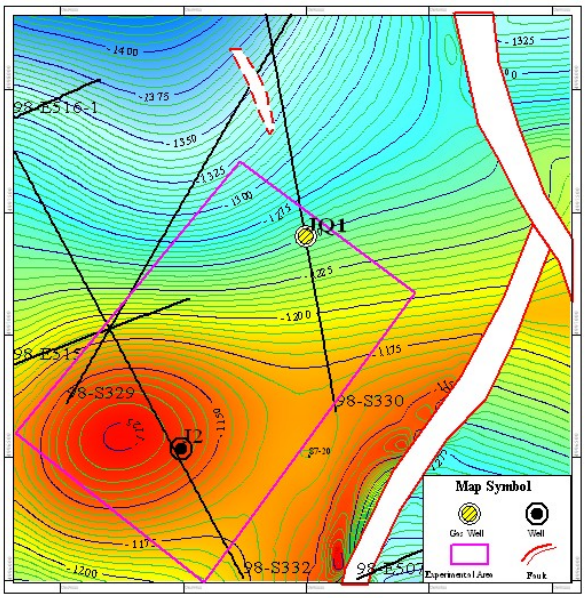

Fig. 2. The main coal seam structure map of experimentation area in Jixi Basin

Table 1 Characteristic of main coal seam in Jixi Basin

coal group	Experiment		mean	range
Upper coal group (81#, 83#, 84#)	Industrial analysis (%)	Fixed carbon	57.76	56.25–61.27
		Ash	7.93	5.83–9.46
		Volatile	32.90	31.46–34.37
		Water content	1.42	1.28–1.52
	Element analysis (%)	C	62.55	49.09–74.03
		H	4.11	3.19–4.83
		S	0.73	0.30–1.46
	Density analysis (g/cm^3)	Apparent	1.30	1.27–1.32
		True	1.32	1.31–1.33
Lower coal group (122#, 123#)	Industrial analysis (%)	Fixed carbon	62.69	61.01–64.14
		Ash	8.16	5.40–10.04
		Volatile	28.29	26.13–29.52
		Water content	0.86	0.82–0.94
	Element analysis (%)	C	66.38	60.28–72.47
		H	3.86	3.41–4.31
		S	1.34	0.23–2.44
	Density analysis (g/cm^3)	Apparent	1.31	1.30–1.31
		True	1.32	1.31–1.32

fourth order sequences, 10 fifth order sequences. Chengzihe formation can be divided into 6 fourth order sequences, 17 fifth grade sequences. The fine contrast shows that the number of coal layers increased and the thickness of the seam increased in the favourable zone. The lower part of the coal bearing section, the lower segment of Chengzihe formaition, is condensed section of seam and the main layers of CBM exploration and development. Especially the lower section of Chengzihe formation, the development has two sets of relatively stable and large thickness of coal seam group. They are the coal seam gas main target layer.

4 Main Controlling Factors and Optimization of Sweet Spots

By observing the core of coal reservoir in Jixi basin, the coal and rock structure of Jixi basin is dominated by primary structure and fragmentation structure. The stress release location of slope is the advantageous part of cleat development(TANG Shuheng,2004; SU Xianbo,2004). Through well-seismic combined contrast of the main coal and layer structure of the objective interpretation, meticulous depiction of main layer structural characteristics and the characteristics of thickness show that favourable area in slope belt of JQ1 well area of Hezuo block structure is relatively simple, large thickness of coal seam, cleat development, resource abundance(LIU Mei,2000;CAI Jinhua,2013). It is a sweet spot(Fig2).

5 Application

Application of this method delineated two favourable zones, preferably two dessert goal, deploying 2 wells. In the dessert zone, the industrial air flow of CBM wells was deployed, and the experimental area will be established.

In conclusion, it suggests that the initial establishment of coal rank coal-bed gas sweet evaluation method is suitable for Northeast rift lacustrine basin, for the northeast to the other fault depressions containing coal basin of successful exploration and development and reduce the coal gas harm to provide technical guidance and reference.

References

Cai Jihua, Yuan Ye, Gu Sui and Liu Hao, 2013. Improving Coalbed Methane Recovery Ratio by Injecting Hot Carbon Bioxide. *Acta Geologica Sinica* (English Edition), 87(z1): 934-935.

Qin Yong, Fu Xuehai, Wei ChongTao, Hou Lin Quan, Jiang Bo, Wu Caifang, 2012. CBM reservoir power conditions and controlling effect. *Beijing: Science Press,* 1-150 (in Chinese).

Su Xianbo, Chen Jiangfeng and Sun Junmin, 2001. Geology and

exploration and development of coalbed methane. *Beijing: Science Press,* 30-100 (in Chinese).

Tang Shuheng, 2000. Resources Conditions of Coalbed Methane Districts in China. *Acta Geologica Sinica* (English Edition), 74(3): 701-705.

Tang Shuheng, Sun Shenglin, Hao Duohu and Tang, 2004. Coalbed Methane-bearing Characteristics and Reservoir Physical Properties of Principal Target Areas in North China. *Acta Geologica Sinica* (English Edition), 78(3): 724-728.

Su Xianbo, Lin Xiaoying, Song Yan and Zhao Mengjun, 2004. The Classification and Model of Coalbed Methane Reservoirs. *Acta Geologica Sinica* (English Edition), 78(3): 662-666.

Liu Mei, Gou Jingwei, Yu Guangming and Lin Jiandong, 2000. Application of Seismic Anisotropy Caused by Fissures in Coal Seams to the Detection of Coal-bed Methane Reservoirs. *Acta Geologica Sinica* (English Edition), 74(2): 425-428.

Zhang Xinmin, Zhuang Jun, Zhang Suian. 2002. China Gas Geology and Resource Evaluation. *Beijing: Science Press*, 150-200(in Chinese).