文章编号: 1006-6535(2001)02-0023-02

运用地震地质信息发现海南 8 井区灰岩潜山

王红玉,安艳波
(辽河油田分公司勘探开发研究院,辽宁　盘锦　124010)

摘要:在勘探程度较低的地区,利用地震信息分析地下地质现象,预测其时代和岩性,并指导油气勘探,在滩海地区海南 8 块获得了成功。古潜山具有捕获油气的有利条件,而储集条件又以碳酸盐岩为最好。所以,海南 8 井古生界灰岩的钻遇,对滩海地区海南中央低凸起深层潜山的研究,起到了巨大的推动作用,也为该区寻找碳酸盐岩油气藏奠定了基础。

关键词:古生界;灰岩潜山;发现;预测;地震信息;地质信息;辽河油区;海南 8 井区
中图分类号:TE122.2^{+}2　　**文献标识码**:A

前　言

辽河滩海地区海南构造带,位于辽河油区海外河油田南部海域。其南部与锦州 9-3 油田毗邻,西接笔架岭及双南油田,东邻盖州滩洼陷。构造范围包括辽海西部凹陷东侧陡坡带及辽海中央低凸起,面积约 450 km^2。海南 8 井区披覆构造位于中央低凸起海南～月东披覆构造带的中部(图 1)。

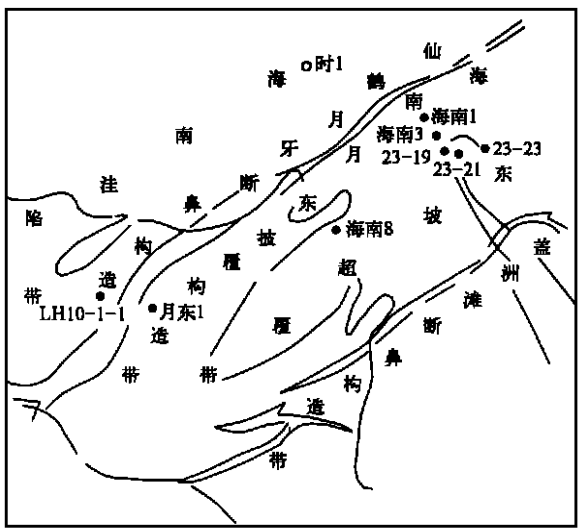

图1　滩海海南构造带工区位置
Fig.1　Location map of study area of offshore Hainan structure beet

本区自 80 年代末开始勘探以来,二维地震测网密度已达 0.6 km ×1.2 km,三维地震已覆盖全区。截止 1992 年,已分别在与锦州 9-3 油田相邻处及西部陡坡带的 2 个正向三级构造上钻探了锦州 10-1-1 井及辽海 11-1-1 井。虽然都已见到了油气显示,但均未获得工业油气流。

近年来,经过精细构造解释研究,部署的海南 1、月东 1、海南 3、海南 6 井,均获得高产工业油气流。但在上述探井中钻遇的均为盖层(N_g～E_3s_{1+2})油气层。由于海南构造带是在基岩隆起背景上发育起来的复式油气圈闭带,第三系发育各种类型的有利圈闭,因此,为了进一步深挖潜能,寻找更多的油气资源,笔者主要利用钻井及地震资料,对前第三系基岩时代及其岩性进行了预测和分析。

1　地震信息及邻井资料的应用

1.1　速度信息

速度反映地下地质结构变化的波动信息,其量值变化、分布特征及其在时空领域里的变化规律均与地质结构相对应;不同埋藏深度的岩层和同一埋藏深度不同类型的岩层地震速度不同。因此,常将速度信息作为判别岩性的重要地球物理参数。

1.1.1　条件

收稿日期: 1999-03-02;改回日期:2000-07-10
作者简介:王红玉(1962-),女,助理工程师,1986 年毕业于辽河石油学校物探专业,现从事石油勘探解释工作. 电话:0427-7833711.

© 1994-2008 China Academic Journal Electronic Publishing House. All rights reserved.　http://www.cnki.net

精细速度谱解释主要应用的是强能量团原理,因此应满足的条件是:

(1) 叠加速度曲线应穿过速度谱上的主要能量团;

(2) 稳定性原则:相邻能量团应为渐变的,且在叠加剖面上有一定的渐变规律;

(3) 能够识别异常波,剔除多次波、断面波、绕射波的干扰。

1.1.2　作用

通过精细解释速度谱,提取层速度和均方根速度信息,分别作出了相应的层速度(V_I)曲线与均方根速度(V_E)曲线(图2)。由图2可看出,在层速度曲线上也相应出现3个变化点:在0～1.9 s之间,层速度为1 750～2 980 m/s;1.9～2.4 s之间,层速度为4 450 m/s;2.4～2.9 s之间,层速度为5 480 m/s。通过速度曲线还可看出:在2 s以下地层的速度变化大,而且速度高。因此可以推测,该套地层为砂砾岩、火山岩或古生界灰岩。

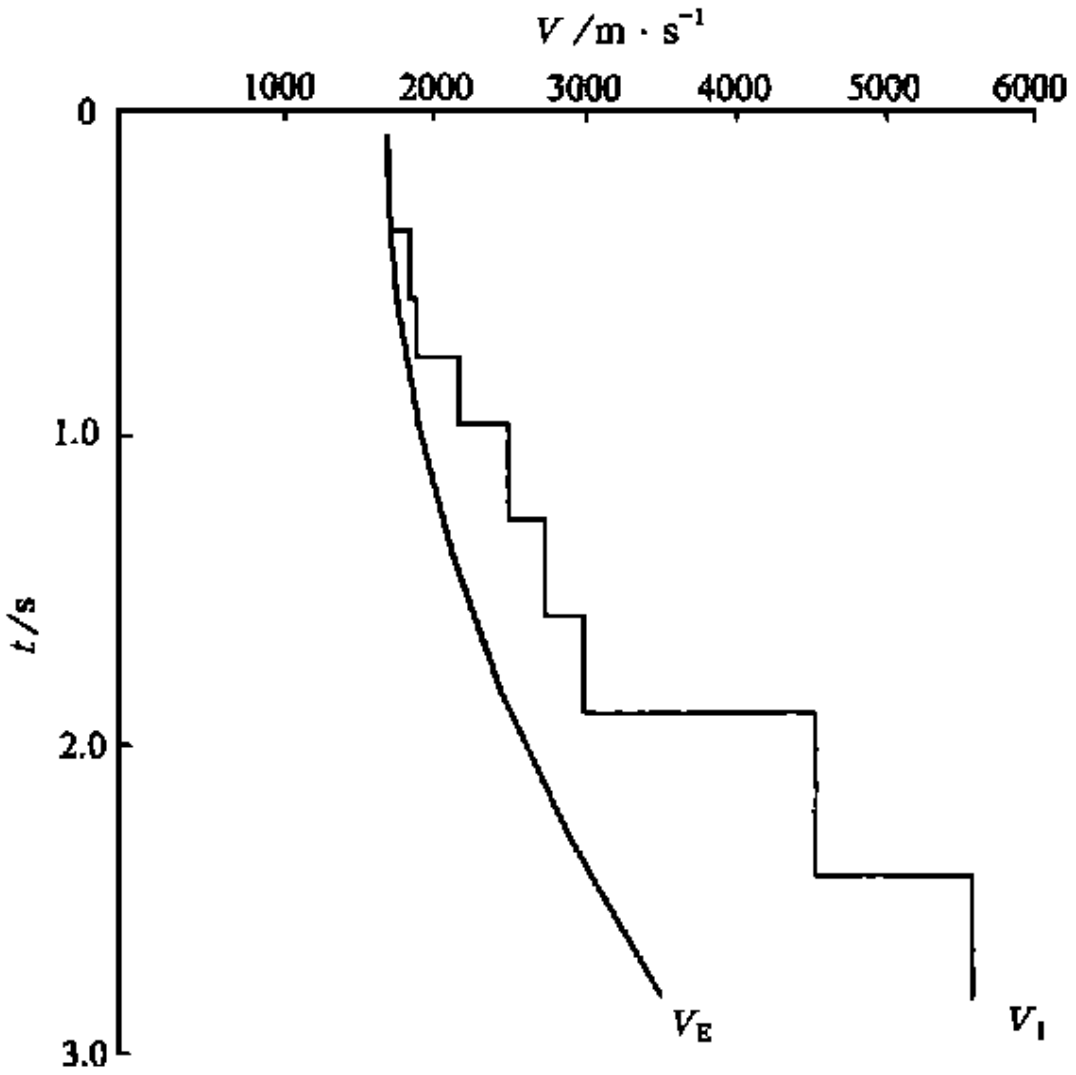

图2　海南8井均方根速度及层速度曲线

Fig.2　Rootmean square velocity and interval velocity curves Well of Hainan 8

1.2　地震反射信息

通过对该区地震剖面的解释和研究发现,在中央凸起东坡基岩反射中,出现了2套与上覆地层成锐角相交的异常地层。其中上一层反射极弱,为杂乱相反射;下层反射较强,呈一组较连续的层状反射。2套地层分界面清楚,较易追踪。2套地层向西北分别以尖灭或剥蚀与上覆地层相接触。结合速度分析推测,上套极弱的杂乱相反射地层为中生界,下套较强的连续反射地层为古生界。通过追踪解释,编制了较强反射层古生界的构造图(图3)。从图上可以看出,其埋深较浅,最小埋深为2 100 m,最大埋深为3 400 m。

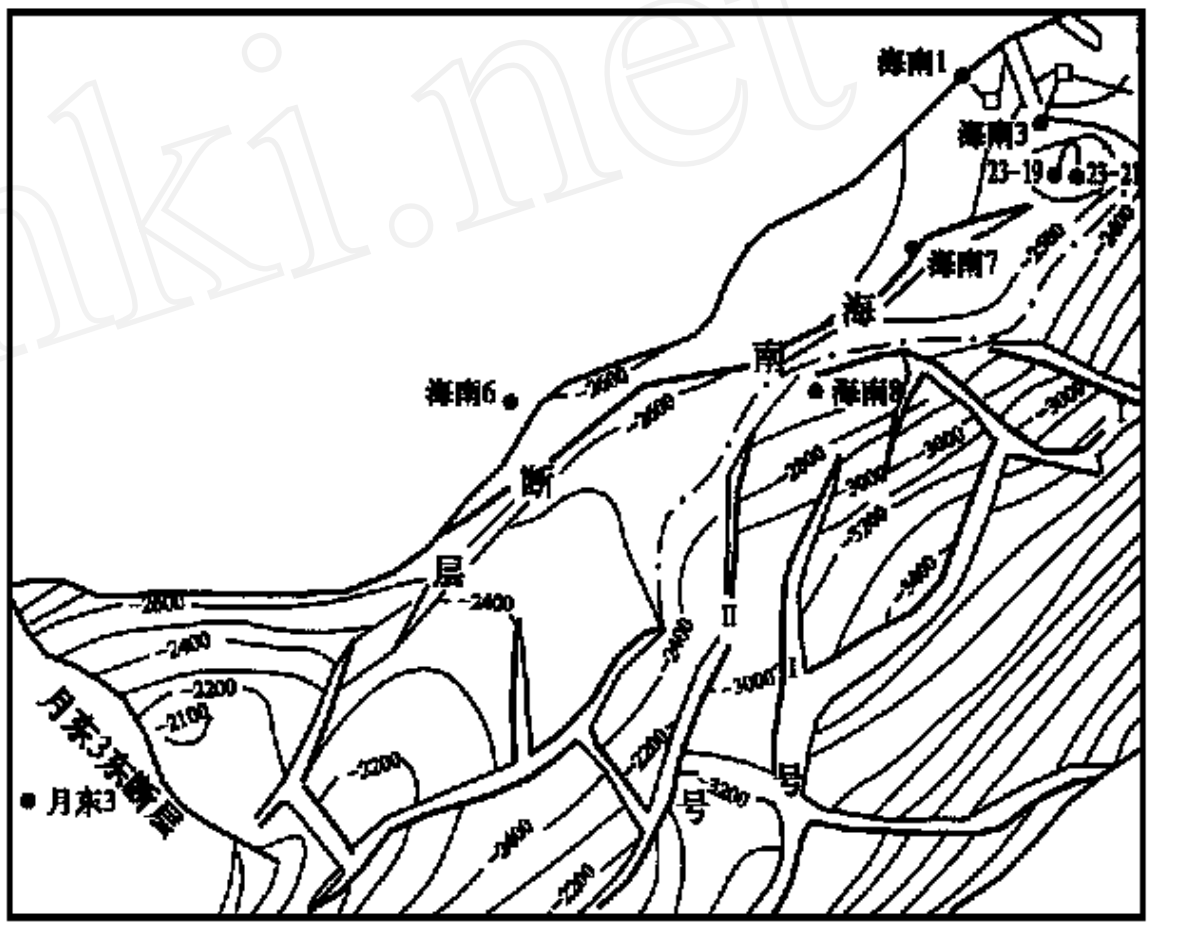

图3　古生界顶界构造

Fig.3　Structural map of Paleozoic top

1.3　综合分析

1.3.1　邻井钻井资料的应用

海南1、6井所在的构造是海南8井区的西邻断块,而海南8构造以东为东坡超覆带,所以,本次研究中主要运用了海南6和海南1井的钻井资料。据钻探揭示,这2口井在沙三段下部沉积的角砾成分为古生界灰岩和中生界火山岩,砾石较大,分选磨圆较差,据此判断搬运距离较近,预测其源岩可能分布在东坡超覆带;而海南8井区构造比海南1、6井更靠近东坡超覆带,因此,其成分也应是来自西侧物源的砾岩、中生界火山岩和古生界灰岩。

1.3.2　剩余重力异常

重力异常与地下地质体的密度有关[1],一般密度大重力异常值高。海南8井区在剩余重力异常图上反映为较高的重力异常值(在100～125 nT之间);在磁力异常图上则表现为低值,微磁性。古生界老地层表现为高重力异常、低磁力异常,由此推断上述地层可能为古生界或中生界。

综上所述,可以确认上一套杂(下转第30页)

© 1994-2008 China Academic Journal Electronic Publishing House. All rights reserved.　http://www.cnki.net

3 结 论

(1) 超稠油油藏储层参数测井解释模型是评价相似油藏储层特征的有效手段。

(2) 泥质含量测井解释模型适用于辽河盆地第三系砂泥岩地层的定量解释;油藏测井评价技术对优化射孔井段、经济合理地开发稠油区块具有很强的实用性和可操作性,对超稠油油藏开发具有重要指导意义。

参考文献:

[1] 康志勇. 辽河油区稠油分类及储量等级划分[J]. 特种油气藏,1996,3(2):7～12.

[2] 雍世和,张超谟. 测井数据处理与综合解释[M]. 东营:石油大学出版社,1996:60～62.

[3] 康志勇. 辽河盆地第三系地层泥质含量测井解释方法研究[J]. 测井技术,1997,21(4):276～279.

[4] 张金钟. 声波地层因素公式及其应用[J]. 地球物理测井,1989,13(6):1～5.

[5] 康志勇. 稠油油藏疏松岩石孔隙度校正方程[J]. 石油勘探与开发,1997,24(2):55～57.

[6] Waxman M H, Smits L J M. Electrical conductivities in oil-bearing sand[J]. SPE Journal , 1968.

编辑 王 威

(上接第24页)乱反射相地层为中生界,而下一套反射较连续的地层为太古界。

2 钻探情况分析

为了验证以上的研究及预测结果,在上述研究的基础上,结合该层的有利条件,确立了海南8井井位。经钻探证实,在该井的底部确实有中生界和古生界存在。其岩性为中生界角砾岩和古生界灰岩、页岩及白云质灰岩,电测解释为油水同层。

海南8圈闭为潜山超覆圈闭,处于辽河滩海中央低凸起之上,东以盖洲滩断裂与盖洲滩生油洼陷相邻。盖洲滩洼陷的沙三段生油岩直接与中央低凸起中生界、古生界的不整合面相接,是东侧的主要油气运移通道,这就为中央低凸起东坡圈闭油气聚集提供了必要条件。由此推测海南8圈闭以东地区及东侧斜坡油气来源主要靠不整合面运移。其西以海南断裂(台安～大洼断裂在本区的延伸[2])与海南及鸳鸯沟生油洼陷相接,有良好的油源条件。且其两侧都有深大断裂作为运移通道,古生界白云岩又是潜山油气储集场所,所以要在海南构造带深层潜山寻找新的油气藏是可能的。基于海南8井古生界的发现,在该构造相邻的西断阶带上海南3井区钻探3口开发井(海南23-19、23-21、23-23),也发现有几米至几十米的古生界灰岩,且电测解释为低产油层。据完钻的月东潜山上的月东3井揭示,在低洼部位的太古界花岗岩之上,也有少量的古生界灰岩分布。北部的海南潜山基岩有中生界火山岩、古生界灰岩及太古界混合花岗岩。月东3井揭示的少量灰岩直接与上第三系地层相接触,而海南潜山上的井揭示的灰岩则位于太古界老地层之上,灰岩之上有中生界地层覆盖。

3 结束语

本次研究,运用了地震及邻井资料等信息,准确地预测海南8井区的古生界灰岩油藏的存在,并为钻探所证实。这一研究成果,为滩海地区今后古生界灰岩潜山的勘探与开发起到一定的推动作用。

参考文献:

[1] 王燮培. 石油勘探构造分析[M]. 武汉:中国地质大学出版社,1990.

[2] 金尚柱. 辽河浅海海滩石油勘探开发研究[M]. 北京:石油工业出版社,1996.

编辑 常汉章

© 1994-2008 China Academic Journal Electronic Publishing House. All rights reserved. http://www.cnki.net

Special reservoir forming characteristics of Gao 7 well, Boxing sag

Wang Bin, Pu Yuguo, Yuan Guangxing

(Chunliang Oil Production Factory of Shengli Petroleum Administrative Bureau, Boxing, Shandong, 256504, China)

Abstract: To enlarge exploration field, find new type of reservoir and complement petroleum geological theories of clastic basin and complex hydrocarbon accumulation concepts of Bohai bay, sedimentary compact research and comprehensive geology analysis are utilized for fracturized mudstone pay zone of Gao 7 well, Boxing sag. It demonstrated that Gao 7 well penetrates through a special reservoir features selfgeneration and self - accumulation whose mudstone fractures are essential reservoir forming condition, and facies and fractures distribution as dominant factors. This type of reservoir is main potentialprospect and enough emphasis should be paid for its future study.

Key words: special oil & gas reservoir, reservoir forming characteristics, Chunliang oil province, Boxing sag, Gao 7 well

Low permeability formation of Jiufotang formation, Qianjiadian sag

Gao Yongfu

(Exploration & Development Research Institute of Liaohe Oilfield Branch Company, PetroChina, Panjin, Liaoning 124010, China)

Abstract: According to its low porosity and low permeability features, litholoty, physical properties and spatial characteristics of Jiufotang formation, Qianjiadian sag were reviewed with the aid of drilling, logging, seismic, chemical experiment and the etc. Continental clastic rock with structures and components of rather low maturity, mainly comprising medium acid eruptive rock, metamorphic rock cuttings, quartz and feldspar, is the main lithology while prominent accumulation spaces are inter & inner - granular and micro - pores. Also, its low porosity and low permeability have all been necessary and essential for the future exploration and production of same area.

Key words: low permeability reservoir, reservoir characteristics, reservoir evaluation, affecting factor, Kailu basin, Qianjiadian sag, Jiufotang formation

Detect limestone buried - hill in Hainan 8 well area from seismic data

Wang Hongyu, An Yanbo

(Exploration & Development Research Institute of Liaohe Oilfield Branch Company, PetroChina, Panjin, Liaoning 124010, China)

Abstract: In low explored area, seismic data were applied for analyzing underground geological structures and predicting the corresponding era or lithology, so that to give instruction to the future oil & gas exploration. Success has been obtained in Hainan 8 offshore block. Buried - hill containing favorable conditions for hydrocarbon trapping in general and carbonate reservoir in particular, so drill through paleozoic limestone in Hainan 8 well has great significance for the study of low upwarping but deep buried - hill in the central part of Hainan offshore, and provide basis for detecting carbonate reservoirs as well.

Key words: paleozoic, limestone buried - hill, identify, predict, seismic data, geologic information, Liaohe oil province, Hainan 8 well area

Comprehensive evaluation for super heavy oil reservoir in Shu 1 area

Zhu Yongjun, Kang Zhiyong, Li Sujie, Zhang Aihua

(Exploration & Development Research Institute of Liaohe Oilfield Branch Company, PetroChina, Panjin, Liaoning 124010, China)

Abstract: Interpretation mode of formation parameters for super heavy oil reservoir and lithology classification criteria are established systematically according to core data with statistical principles and logging evaluation techniques, through which basis for rational development and classified evaluation of Shu1 super heavy oil reservoir is also presented. Results demonstrate that the studied formations fall within three categories, namely type Ⅰ, Ⅱand Ⅲ, which occupies 61.3 %, 33.4 % and 5.3 %, respectively. Four pilot thermal producing wells have obtained ideal results with the study achievements. Meanwhile, evaluating super heavy oil reservoir with logging measures can provide reliable formation parameters and features very strong applicability and operability for rational development and optimal perforated sections.

Key words: super heavy oil, reservoir evaluation, steam soaking, interpretation model, Shu 1 area

Mathematical model for three fields matching in development

© 1994-2008 China Academic Journal Electronic Publishing House. All rights reserved. http://www.cnki.net