



中国

石油与天然气资源

周玉琦 易荣龙 舒文培 何治亮 等编著

中国地质大学出版社

内容简介

本书是在《中国油气资源预测系列图》的基础上编写的关于中国油气盆地、含油气新领域和油气资源前景的一本专著。它论述了中国含油气区大地构造背景、原型盆地及其改造作用;中国海相油气领域、陆相非构造油气领域、煤成油气领域和低熟油气领域的理论进展、资源分布与油气潜力;中国主要油气区或盆地的勘探进展与潜力,并对 100 余个盆地做出分级评价,进而预测 2010—2015 年中国将逐步达到年产石油 1.8~2 亿 t 峰值,并年产天然气 1 000 亿 m³。

本书可供石油界、技术经济界人士和科研与教学人员阅读、参考。

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周玉琦 教授级高级工程师

1977年毕业于成都地质学院石油地质系。1983—1984年在挪威特隆赫姆工业大学进修。1980年在地质部华东石油地质局从事石油地质研究与勘探开发。1994年起历任地矿部石油地质海洋地质局总工程师、中国新星石油公司总地质师。从事我国油气盆地研究与勘探部署。主持多项油气勘探开发与科技攻关，在东海、塔里木、鄂尔

多斯等盆地的油气发现与勘探开发中做出了重要贡献。现任中国石化国际石油勘探开发公司副总经理，从事海外油气合作勘探开发，并兼任中国地质学会副理事长、中国石油学会常务理事及石油地质专业委员会副主任。

曾任《石油与天然气地质》和《石油实验地质》编辑委员会主任。

主编《朱夏油气地质理论应用研讨》等文集，发表论文十余篇。



易荣龙 教授级高级工程师

1963年毕业于成都地质学院石油地质系。1963—1966年在地质部第五普查大队从事江汉盆地石油地质研究。1966—1996年在地矿部石油地质综合大队，长期从事全国油气盆地分析与勘探研究。历任课题组长、教师、研究室副主任、高级工程师、

科技与教育办公室主任、副大队长兼总工、湖北省石油学会副理事长及石油地质专业委员会主任。1997—2000年任中国新星石油公司勘探研究院教授级高级工程师，主持“中国油气资源预测与编图”项目研究。现为中国石油化工集团公司科学技术咨询委员会专家。发表有“塔里木盆地古生界油气前景”（1980）、“二〇〇〇年中国的石油、天然气资源”（1985）、“中国海相油气盆地分析”（2001）、“中国油气资源前景探讨”（2003）等论文20余篇。著有《四川盆地西部天然气资源与勘探开发》。多次获得优秀论文奖，获地质矿产部及中国石化集团公司科技进步奖。



舒文培 教授级高级工程师

1963年毕业于西南石油学院石油地质专业。在地矿部石油地质综合大队长期从事南方海相油气调查、研究。于1969年参加了李四光部长亲自部署、指导的塔里木盆地石油地质调查研究工作。在1982年的中日合作鄂尔多斯盆地遥感石油地质调查工作中，任中方专家组组长。多次主持中西部地区鄂尔多斯盆地、塔里木盆地、巴丹吉林-腾格里地区和青藏高原的石油地质、遥感、化探调查与选区评价研究工作。曾任研究室主任。著有《四川盆地西部天然气资源与勘探开发》专著，发表“中国油气田（藏）形成规律及烃类生成模式研究”、“地矿部油气资源遥感的实践与展望”等论文十余篇。其中“苍茫大地，谁主沉浮——地壳运动原因探讨”（摘要）等两篇文章在1996年8月北京30届国际地质大会发表。所主持完成的成果多次获得地矿部及中国石化集团公司科技进步奖。



何治亮 教授级高级工程师

1982年毕业于中国地质大学(武汉)矿产普查与勘探专业。在地矿部石油地质综合大队长期从事中国东部油气盆地分析与综合评价研究与西部主要是塔里木等盆地的分析、评价与部署研究。历任研究室主任、副总工、中国新星公司勘探研究院副院长兼总工、湖北省石油学会副理事长及石油地质专业委员会主任、《石油与天然气地质》编辑委员会副主任。现任中国石化勘探开发研究院副院长兼西部分院院长。发表有《塔里木多旋回盆地与复式油气系统》等2部专著及“中国海相盆地油气勘探潜力分析”、“中国油气勘探战略与规划部署”等论文20余篇。多次获得优秀论文奖、地矿部及中石化集团公司科技进步奖。

勘探資源
海陸求索

宋健

二〇〇四年筆

宋健院士：原中国人民政治协商会议副主席，原中国工程院院长。

序

石油与天然气资源关系国计民生和国家经济安全。世纪之交,关于中国油气资源发展前景问题引起广泛的关注和讨论。不论从政治、经济,还是从科学技术的角度出发,都应重视油气资源和接替能源的战略部署。

作为科技工作者,我们应该具体分析中国大地构造演化、沉积盆地形成与改造及其含油性来研究问题、解决问题。

1941年潘钟祥先生根据中国陆相沉积地质条件提出“陆相生油”理论,为中国油气勘探奠基。经过几代人艰苦努力,在中、新生代陆相沉积盆地中,油气勘探开发第一次创业取得重大成就,年产石油达16 000万t,居世界第5位。但是还应看到我国前新生代海相残留盆地的油气领域十分广阔,潜力巨大。近几年,东部胜利油田及西部塔河油田都分别在古生代海相沉积盆地中发现大型油气田,探明数亿t油气储量,揭开了中国油气勘探开发二次创业的序幕。

《中国石油与天然气资源》及《中国油气资源预测系列图》是中国石化新星石油公司科技工作者多年勘探与研究的结晶。作品对中国陆相和海相沉积的成盆、成烃、成藏特征做出了深入的分析 and 翔实的描绘;对中国陆相非构造油气藏领域、海相油气领域及煤成油气领域都有很好的论述。特别是关于我国未来十多年“稳油增气”的勘探发展思路,以及2010—2015年我国可能逐步实现年产石油(18 000~20 000)万t,年产天然气(500~1 000)亿 m^3 ,并持续发展的预测,是基于我国油气地质条件和勘探开发实际而提出的乐观见解,也是对新世纪中国油气资源发展前景问题的一份重要答卷。

回顾上世纪中国油气地质研究及勘探开发的艰难曲折与成功的历程,展望未来,我深信坚持理论创新与技术进步,大力加强油气勘探开发与科学研究,中国油气勘探开发二次创业的光明前景是指日可待的。

中国科学院院士:



2002年10月14日于武昌

FOREWORD

The oil and gas resource is a matter that concerns the people's livelihood and nation's economy safety. At the turn of century, the issue on resource prospects in China has drawn extensive attention and discussion. In view of the politics, economics, science and technology, the importance should be attached the strategic plan of petroleum resources and replacing energy.

As science – technicians, we should specifically analyze China's tectonic evolution, and the formation, reconstruction and hydrocarbon occurrence in China's sedimentary basins to research and solve this issue.

In 1941, Prof. Pan Zhongxiang put forward the theory of "oil generation in continental deposit", based on the geologic conditions of continental deposit in China, which settled the theoretic foundation for oil and gas explorations in China. After the arduous efforts of several generations, a number of significant discoveries have been made in Mesozoic and Cenozoic continental clastic basins, introducing the first blooming period of Chinese oil and gas exploration and development. The annual oil production reaches to 167 million tons, ranking the fifth in the world. It should be noted, however, that the exploration domains in pre – Cenozoic marine remnant basins are still vast, with a great petroleum potential. Recent major discoveries, with the reserve class of 100 million oil equivalent tons, have been obtained from the Paleozoic marine deposits in Eastern China's Shengli oil field and Western China's Tahe oil field, which undoubtedly opens the prelude of the second blooming period of Chinese oil and gas exploration and development.

"The Petroleum Resources in China" and "The Series Map of Petroleum Resource Prediction in China" are the products of prolonged exploration activities and research works by the scientists employed in Sinopec Star Petroleum Corporation. These publications clearly describe the characteristics of basin formation, hydrocarbon generation and accumulation both in Chinese continental and marine deposits, and define the most promising targets for future Chinese petroleum exploration, including the non – structural oil and gas pools in continental strata, the oil and gas resources in marine strata and coal – derived oil and gas resources. Especially, these publication present the E & D strategy of "stabilizing oil production and increasing gas production" for future ten or more years, and make the forecast that China's oil and gas annual production might increase from 180 million tons and 80 billion m³ to 200 million ton and 1 000 billion m³ respectively in 2010 – 2015, which is the optimistic opinion provided on the basis of petroleum geology conditions and exploratory development activities in China and is also an important answer for the development prospect of China's petroleum resources in new century.

Through the review of the difficult but successful process of petroleum geology research and exploration in China in last century, I believe strongly that the second blooming period of Chinese petroleum exploration and development is coming, while a new theory and a new techniques are constantly adopted in upstream oil and gas industry and much more intensive exploration and thorough scientific research are conducted.



Academician, Academy of Science of China

14/10/2002

序

石油与天然气是人类赖以生存、发展的不可再生资源,是我国急需而又短缺的矿产,其重要性不言而喻。

《中国石油与天然气资源》和《中国油气资源预测系列图》立足我国油气地质条件及勘探现状,从当今油气地质理论创新和勘探技术进步的高度,对我国油气资源潜力和勘探发展做出了宏观预测。其主要特点是:

1. 以含油气区地球动力学为背景,以沉积盆地分析为基础,将我国油气盆地进行分类,论述其结构与油气系统特征,明确地反映了我国大地构造特征与油气分布的相关性,是预测含油气新地区、新类型与新领域的重要理论导向。

2. 从我国海相油气勘探与研究的曲折与成功中,分析海相成烃、成藏条件及油气分布特征,论述中生代和古生代海相盆地改造作用的多期性、油气系统的复杂性及保存条件的重要性。还预测了我国海相沉积的油气潜力,为海相油气勘探提供了新的思路。

3. 概述我国陆相盆地成烃与成藏理论及其在低熟油气和煤成油气方面的进展。分析我国煤—油—气共生盆地的成烃与成藏条件,进而论述全国煤成油气和低熟油气的分布特点,对陆相油气勘探向煤成油气和低熟油气领域扩展有导向作用。

4. 根据盆地的基本油气地质条件及油气潜力,对我国 125 个含油气盆地进行了分级评价。结合主要盆地勘探进展和发展趋势,从全国的层面上提出了“稳油增气”的勘探发展思路,以及 2010—2015 年逐步实现年产石油(18 000~20 000)万 t,年产天然气 1 000 亿 m^3 的构想。对制定我国油气勘探开发中、长期规划与战略选区具有重要参考价值。

我认为,本专著与油气预测系列图是一份理论联系实际,紧密结合我国油气勘探实践的、具有较高学术水平和很强应用价值的优秀科研成果。其内容丰富,立论有据,思路新颖,构想宏伟,体现了科研为国民经济、为社会服务的宗旨。

特此向学术界和技术经济界推荐。

中国科学院院士:

刘宝瑞

2001 年 8 月 16 日于成都

FOREWORD

Petroleum & gas is a necessary and non – renewable resource for the existence and development of modern industry & economy. It is also a badly – needed yet exiguous mineral resource in China, so we can't talk about its importance enough more today.

Base on our country's geologic conditions and exploration situation, "The Petroleum Resources in China" and "The Series Map of Petroleum Resource Prediction in China" have made a macroscopic prediction about the potential of petroleum & gas resources and exploration in China from the angle of theoretical innovation and advanced technology in oil and gas industry. Their features are expressed in the following:

1. based on the geodynamics theory, the two reports have classified oil – and oil – contained basins in China, discussed their structures and features of oil & petroleum system, and also expressed the correlation the geotectonic features and oil and gas distribution, thus serving as a guideline to predict new regions, types and areas which are related with oil and gas prospects;

2. based on the theories of sediment and sequence formation, they have analyzed our country's deposit basins of various types, and thereupon discuss the types of non – conformation oil and gas pool, pool – forming conditions, their distributing patterns, potentials and exploration and developmental prospects, characteristic of not only theoretical innovation but practical significance;

3. based on the setbacks and successes in our country's research and exploration work of marine strata petroleum and gas, the reports have analyzed marine strata hydrocarbon generation, pool – forming conditions and their distributing features. The discussion also involves the multi – periods of tectonically rebuilding effect of marine basins in Mesozoic and Paleozoic age, the complexity of oil and gas system and the importance of preserving conditions. They have predicted marine strata petroleum prospects in China and provided a new vision for marine strata petroleum exploration in our country;

4. the reports have discussed hydrocarbon – generating and pool – forming theories in China's continental clastic basins, and the progress made in the researches of low – mature hydrocarbon & coal – derived hydrocarbon. The analysis also includes the hydrocarbon – generating and pool – forming conditions in coal, oil and gas concomitant basins in China, and the distributing features of low – mature hydrocarbon & coal – derived hydrocarbon., giving some directions for the expansion of continental oil and gas exploration to coal – deriving hydrocarbon and low – mature hydrocarbon areas in China, and

5. in terms of basic geo – petroleum conditions and resource potentials, the two reports have evaluated 125 deposit basins at different levels in China and, in connection with the exploration advance and growing trends in our main basins, put forward a strategic thought of " stabilizing oil production and increasing gas output" from a nationwide angle, making a prediction of a progressive annual output of 180 – 200 million tons of oil and 100 billion cubic meters of gas in 2010 – 2015. The research results provides a significant reference for making medium and long – term oil & gas exploration and development plans in China.

To my mind, this monograph, together with " The Series Map of Petroleum Resource Prediction in China" , is a excellent research result which is characterized by a combination of theory with practice, a close connection with our country's oil exploration situation and very high academic and practical values. They are abundant in content and well – grounded in evidence. They show a novel conception in the area and give a panoramic consideration to its research topic, explaining to us how research work serves our economy and society.

I take it a honor to recommend them to our friends in academia, economic and technological circles.

Liu baojun

Academician, Academy of Science of China

16/08/2001

序

石油是关系到国民经济安全的重要战略资源。在新世纪之初,由于我国经济发展对石油的需求量的快速增长,关于中国油气资源潜力和勘探开发前景的问题已成为石油界、经济界和学术界关注的热点。值此,中国油气资源预测研究成果的问世,无疑是中国石化新星石油公司系统科技工作者的一个重要贡献。

该项成果全面综合地概括了我国油气勘探的理论、勘探开发进展与成果。在对我国主要盆地油气资源条件深入分析的基础上,从现代油气地质理论和技术发展的角度,对海相油气领域、陆相非构造油气藏领域、煤成油气领域及低熟油气领域的资源潜力做出了系统的宏观预测。特别是对近海海域第三系及前第三系油气勘探前景良好的推测,值得我国石油界的重视。

该项研究提出的“稳油增气”的发展思路,以及用 1015 年的时间,在新疆地区和近海海域培育两个年产油气 5 000 万 t 当量的新的特大型油气区的构想,很有前瞻性。对中国油气资源战略规划、勘探开发部署具有重要参考价值。

作为一个老的海洋石油工作者,在此向同仁们推荐《中国石油与天然气资源》专著及《中国油气资源预测系列图》这一项重要研究成果,以期互补共进。

中国工程院院士:

金庆焕

2001 年 9 月 4 日于广州

FOREWORD

Petroleum is an important resource in relation to the national economic safety. In the early new century, the problem about the potential of oil & gas resource and the prospect of exploitation and development has been a hot point in the field such as petroleum, economy and academy because of the fast increasing demand to petroleum as a result of the national economic development. The publishing of researching result about oil & gas resource forecasting affirmly is an important contribute of the science & technology worker in CNSPC.

The research result has roundly and synthetically generalized the theory and the progress of oil & gas exploitation and development in our country. On the base of thorough analysis to oil & gas resource condition of main basin in china, it has systematically and macroscopically forecasted the resource potential in oil & gas field of marine phase, non-structure of land phase, gas from coal and lowerly mature oil & gas from the point of modern oil & gas geologic theory and technologic development. Especially, the good appraise to oil & gas resource potential and the exploiting prospect of Tertiary and lower Tertiary in the seashore of china should be attached importance to petroleum field.

The developing thought of stabilizing oil and increasing gas which the research result has put and the advice about building two new great oil & gas field which can produce annually 50 million ton crude oil within 10 to 15 years in Xinjiang region and seashore bear a foresight. It possesses important referring worthiness to tactic programming and arrangement of exploitation and development.

As an old marine oil worker, in order to promote each other I recommend the treatise of Oil & gas resource of china and A series assessment map of oil & gas resource in china.

Jin Qinghuan Academician of The Academy of Engineering of China

04/09/2001

前言

石油是商品,也是不可再生的重要战略资源。对于我国石油资源的评价、预测,不仅关系到油气勘探开发事业的发展,还影响到国民经济和国家安全。

20 世纪 50 年代关于我国发展人造石油,还是发展天然石油的讨论,是新中国第一轮油气资源预测与战略决策。其结果是确定了重点发展天然石油的方针,制定了石油勘探“战略东移”的部署。从而发现了松辽、渤海湾等东部地区多个大型油气田,使我国在 1978 年达到年产石油 1 亿 t,跻身世界石油大国行列。

20 世纪 80 年代初,国家为制定 15 年国民经济发展规划,确立了《二零零零年的中国》的战略研究项目。其中,关于中国石油年产量规划目标的论证,是又一轮关于石油资源战略的重要讨论。地质部门由杨朴主持了《2000 年中国石油、天然气资源》的论证,在第一轮全国油气普查及油气资源定量预测的基础上,提出了 2000 年年产石油两亿 t 的规划目标建议。1985 年全国人大通过的国民经济 15 年发展规划采纳了这一建议,避免了“年产 4 亿 t”的盲目性。

但是由于 80 年代新理论、新技术的引进还处在初期,加之勘探投入不足,全国石油年新增探明储量徘徊在 5 亿 t 左右,出现了勘探与开发入不敷出的局面。90 年代,由于新理论、新技术应用日臻成熟,加之勘探开发投入力度加大,使年新增石油探明储量达到(7~9)亿 t,全国石油年产量达到 1.6 亿 t 以上,还呈现出石油储量、产量稳定低幅增长的态势。但是由于国民经济的高速发展,对石油需求量急速上升。从 1993 年起我国又成为石油净进口国。2000 年全国进口石油高达 6 900 多万 t。这就是 21 世纪初我国油气勘探开发业所面临的严峻形势。

此间,如何评价、预测我国未来的油气资源潜力及勘探开发前景,有着十分重要的战略意义。1991—1995 年期间,原石油部全国第二轮油气资源评价研究,曾做出了中国石油总资源量为 940 亿 t 的预测和相关评价,为我国油气资源战略规划与部署构建了新的平台。同期,原地矿部《中国油气地质评价系列图》的研制,涵盖全国 488 个盆地,提出了 10 个待勘查区,对全国油气资源前景也做出了评价与预测。全国天然气资源国家攻关研究,预测全国天然气总资源量达到 $(38 \sim 43) \times 10^4$ 亿 m^3 ;同时估算的全国主要含煤区煤层甲烷资源的代表值为 16.46×10^4 亿 m^3 。

从 1996—2000 年期间,中国石油集团、中国石化集团及中海油总公司系统分别对重点盆地或所属探区的油气资源潜力开展了第三轮的评价与预测。但没有全国性的汇总与综合研究。

同期,原中国新星石油公司为迎接新世纪的曙光,发挥油气地质评价与预测的特长,确立了新一轮的“中国油气资源预测与编图”研究项目,以期对 21 世纪初我国油气地质理论的进展、油气资源分布与潜力以及勘探前景做出宏观的预测,对勘探战略选区提出建议。该项目委托原中国新星石油公司勘探研究院(现更名为中国石化勘探开发研究院荆州新区勘探研究所)承担。在公司领导的直接指导下,由易荣龙及舒文培两位教授级高级工程师负责和多位教授、专家参加,历时 4 年余,对我国油气勘探与综合研究的成果进行了调研和整理,编制了全国专题性与综合性的油气预测系列图。在此基础上,就全国海相沉积与陆相沉积的成盆、成烃、成藏理论进展和含油气新领域做了专题总结,对主要油气区资源潜力及全国油气资源前景做出综合评价预测,编写了《中国油气资源预测》分析报告。

2002—2003 年,在原“八五”、“九五”项目研究的基础上,笔者们通过一年多的补充、修改与再创作,编著成为本书。以期与学术界同仁进行交流和研讨,共同促进我国油气勘探开发业的发展和油气地质理论的繁荣。

本书的主题是中国油气盆地分析与含油气新领域及其油气资源分布与潜力。

它分别论述了中国含油气区板块构造背景与板内大陆变形特征;油气盆地原型及其沉积分析;盆地油气系统特征;盆地的改造作用;中国海相成盆、成烃、成藏理论的进展及海相油气资源的分布与潜力;中国

陆相油气的基本理论及其在低熟油气、煤成油气方面的进展与新的含油气领域(即非构造油气藏领域、煤成油气领域与低熟油气领域),以及陆相油气资源分布与潜力;中国油气盆地的分级评价,主要盆地勘探进展、资源潜力与勘探发展的战略方向。

通过跟踪统计,2000年底全国石油远景资源量达到1 224亿t;累计探明石油储量达到214亿t,探明率为18%左右,还应有较大资源潜力。预测未来十多年石油探明储量与产量仍将保持低幅增长的态势;全国天然气远景资源量已达到 62×10^4 亿 m^3 ,而累计探明储量仅31 975亿 m^3 (含溶解气),探明率很低。近十年来天然气年新增探明储量已超过1 000亿 m^3 ,增储上产潜力很大。此外,多项研究表明我国煤层气总资源量在 $(20 \sim 30) \times 10^4$ 亿 m^3 左右,也是一个潜在的勘探领域。

值得注意的是新疆与近海海域油气勘探形势很好,有望发展成为两个新的、年产油气5 000万t当量的特大型油气区。加上松辽、渤海湾、鄂尔多斯、四川及柴达木等盆地的可持续发展,从而我们预计2010年至2015年全国石油年产量将逐步达到(1.8~2.0)亿t峰值,并稳定一个时期;全国天然气年产量将达到1 000亿 m^3 ,并持续稳定增长。

本书前言由周玉琦编写,第一章由李晋光编写,第二章由熊永旭、黄泽光编写,第三章由吴金才、熊永旭、易荣龙编写,第四章由易荣龙、黄泽光、舒文培编写,第五章由黄泽光、徐宏节编写,第六、第七章由舒文培、余琪祥编写,第八章由易荣龙、舒文培、何治亮编写,第九章由林宗满、江圣邦编写,第十章由黄泽光、林宗满编写,第十一章由何治亮编写,第十二章由林宗满、易荣龙编写,第十三章由阎秀刚编写,第十四章由邵鸿良、刘继顺、余琪祥编写,第十五章由易荣龙、黄泽光、邵鸿良编写,结语由周玉琦、易荣龙编写。全书由易荣龙统稿,由周玉琦审定。计算机制图由陈玉华、汤慧珉、韩秀菊、李燕、焦红艳、宋昕等完成。

然而,由于作者水平有限,资料收集并不完整,研究深度也不够,一些重要的油气理论问题还有待继续探讨。对我国油气勘探新领域的推论,对全国油气勘探开发前景的预测都需要接受实践的检验,并加以修正。因此,诚望得到读者的批评与指正。一位石油界同仁指出,“这(书)是地质家的‘正演’”。因此我们认为更需要勘探家的“反演”。以期在不断的“正演”与“反演”的拟合中,为21世纪中国油气工业的繁荣做出新的贡献。

《中国石油与天然气资源》和《中国油气资源预测系列图》的出版,要感谢中国石化集团新星石油公司和中国石化石油勘探开发研究院及其荆州新区勘探研究所给予的大力支持和帮助。同时还要感谢新星石油公司西北、西南、华北、东北、华东、中南石油地质局、上海海洋石油局、国土资源部广州海洋调查局以及原新星公司无锡实验地质研究院、南京物探研究所和国土资源部青岛海洋地质研究所等单位在原项目研究过程中给予的支持和帮助。

在本书编写和系列图的编制中还参阅并引用了国土资源部、中国石油集团、中国石化集团、中海油总公司及中国联合煤层气公司等有关单位的资料、文献,特致谢忱。但因涉及文献、资料甚多,除在本专著参考文献目录中尽量列举之外,恐有疏漏,敬请鉴谅。

在原项目研究与本书编写中还得到刘光鼎、李廷栋、刘宝珺、金庆煊、任纪舜、张国伟等院士和吕华、王金琪、钟特强、郭正吾、罗志立、韩新民、孙肇才、康玉柱、冯志强、张渝昌、孙万禄、蒋炳南、赵金海、邓中凡、彭大钧、张抗、陈晓东、邱阳辉、陈日恒、张福礼、丘东洲、刘池阳、周才凡等教授、专家的指导和帮助,在此一并致以衷心感谢。

周玉琦

2002年9月25日

Introduction

Petroleum is a commodity and also is an important non – renewable strategic resource . The assessment and prediction of petroleum resources is not only related to development of petroleum E&D activities but also influence the development of national economy and safety of national defense .

In the early 1950s , the discussion on the development of man – made oil or natural oil is essentially the first strategic debate regarding the resource prediction and decision in China . It is resulted in establishing the development policy of natural oil and the “ strategic eastward move ” plan of oil exploration , which lead to the discoveries of Daqing , Shengli , Liaohe , Huabei and Dagang giant oil (– gas) and gas fields . In 1978 , China ’ s annual oil output reached 100 million tons , ranking among the powerful oil – producing countries of the world .

In the early 1980 ’ s , the national key strategy research project of “ the 2000 in China ” was set up in order to formulate the 15 – year development plan of national economy , in which the argument concerning the projected goal of China ’ s annual oil output became another important discussion of China ’ s oil resource strategy . Based on the result of the first round of national petroleum resource assessment . Mr. Yangpu , the director of the Bureau of Petroleum Geology and Marine Geology , the Ministry of Geology and Mineral Resources , was in charge of the argument of China ’ s oil and gas resources in 2000 ” and proposed the suggestion that China ’ s projected goal of oil annual output in 2000 might be 200 million tons . This suggestion was adopted in the 15 – year development plan of national economy permitted by National People ’ s Congress in 1985 , avoiding the blindness in “ oil annual goal of 400 million ton ” . In the 1980 ’ s , the annual oil in place reserve addition fluctuated 500 million tons in light of inadequate exploration activity , with a very low reserve – production ratio . In the 1990 ’ s , the annual oil in place reserve addition and oil output reached about 700 million tons and 160 million tons respectively in light of increased exploration activities and application of new petroleum geology theory and E&D technology , with a stable but low – rate increase trend in oil reserve and production . Since 1993 , however , China became an oil net import country along with national economy advances and rapid oil demand increase . In 2000 , China ’ s oil import has reached as high as more than 69 million tons . It is the serious situation faced with the China ’ s petroleum exploration and development in the beginning of the 21st century .

Therefore , the evaluation and prediction of future petroleum resource potentials and exploration prospects in China has a very important strategic significance . It is estimated from the second round of national oil and gas resource assessment in 1991—1995 , charged by the former Ministry of Oil Indus-

try, that China's total oil in place resource is 94 billion tons, laying a sound foundation for national oil and gas resource assessment. In the same period, the ranking assessment and optimistic prediction on petroleum resource prospects in China were also made from "the Series Map of Petroleum Geology Evaluation in China" edited by the former Ministry of Geology and Mineral Resource, in which 488 basins were covered and 10 new exploration target areas were selected based on the classification and resource evaluation of more than 100 petroliferous basins. In addition, it is estimated from the national key scientific project on natural gas resources that China's total natural gas resource is 38 ~ 43 trillion cubic meters.

During the period of 1996—2000, the China National Petroleum Corporation (CNPC), China Petroleum and Chemical Corporation (SINOPEC) and China National Offshore Oil Corporation (CNOOC) conducted the third round of national oil and gas resource assessment on their key basins and exploratory regions. In the same period, the research project of a new round of "Prediction and Mapping of China's Oil and Gas Resources" was established by the former National Star Petroleum Corporation in order to make a regional prediction on the China's petroleum resource distribution and exploration prospect in the beginning of the 21st century and to provide the suggestions on the strategic selection of exploratory regions. This project was undertaken by the former Institute of Petroleum Exploration, the National Star Petroleum Corporation (lately renamed by the Jingzhou Institute of Frontier Petroleum Exploration, SINOPEC Exploration & Production Research Institute). Under the direct guidance of the Corporation leaders, the project team, which is composed of highly-trained and experienced scientific staff and chaired by Prof. Yi Ronglong and Prof. Shu Wenpei, carried out a systematic investigation and study of petroleum exploration and research data in China in the period of 4 years. Its main results are "The Series Map in China's Petroleum Resources" (7 sheets, 1:4,000,000) and the research report on China's petroleum resource prediction.

In general, the book summarizes the results, predictions and suggestions of the project "the Prediction and Mapping of Petroleum Resources in China". Its publication is expected to exchange and discuss our understanding with the colleagues of learned society, and to promote jointly the development of petroleum exploration and geology theory in China.

The research theme of this project is the China's petroleum basin analyses, new petroleum exploration domains and their resource potentials. The research report defines and describes the framework and evolution in China plate tectonics; prototype and reworked processes of Chinese petroleum basins and their petroleum systems; advances in the fields of basin-forming theory, hydrocarbon-generative theory, pool-forming theory progresses in Chinese marine strata; distribution and potential of petroleum resources in Chinese marine strata; basic theory of China's continental oil and gas resources and research advances in the fields of low-mature hydrocarbon and coal-derived hydrocarbon; distribution and potential of petroleum resources in continental strata; three new domains of continental oil-

gas exploration and development (i.e. the non – structural oil and gas pool domain , low – mature oil and gas domain and coal – derived oil and gas domain) and their resource distribution and potentials ; resource evaluation and ranking of petroleum basins in China ; exploration status and resource potentials of major petroleum basins in China .

It is estimated from the study of this project that the total oil resource in China is 105.1 billion tons , with 20% of reserve – resource ratio . In the coming 10 years , a slowly increasing trend of oil annual reserve and production will be kept up . The total natural gas resource is estimated to be 54 trillion cubic meters but accumulative proven natural gas in place reserve is only 3,198 billion cubic meters (including dissolved gas) , with a very low reserve – resource ratio . In recent years , the annually proven natural gas reserve addition is 100 billion meters , with a great potential of reserve and production increase . Moreover , it is indicated from many research projects that Chinese coal bed gas resource is estimated to be 20 ~ 30 trillion cubic meters , which is an other potential exploration domain .

It is worthy of attention that large reserves are being found in Xinjiang and offshore areas , which might be expected to be two new prolific regions with an annual production capacity of 50 million tons of oil equivalent . In addition , some breakthroughs in oil and gas exploration have been continuously made in Songliao , Pohai Gulf , Ordos and Sichuan basins . As a result , a low but stable increase goal in China's oil – gas production and reserves can be achieved . Such plan can be constructed that the China's annual oil and natural gas productions will increase progressively from 180 million tons and 80 billion cubic meters to 200 million tons and 100 billion cubic meters respectively during the period of 2010 – 2015 .

In this book , the preface is written by Zhou Yuqi , Chapter I by Li Jinguang , Chapter II by Xiong Yongxu , Huang Zeguang , Chapter III by Wu Jincai , Xiong Yongxu and Yi Ronglong , Chapter IV by Yi Ronglong , Huang Zeguang and Shu Wenpei , Chapter V by Huang Zeguang and Xu Hongjie , Chapter VI 、 VII by Shu Wenpei and Yu Qixiang , Chapter VIII by Yi Ronglong , Shu Wenpei and He Zhiliang , Chapter IX by Lin Zongman , Jiang Shengbang , Chapter X by Huang Zeguang and Lin Zongman , Chapter XI by He Zhiliang , Chapter XII by Lin Zongman and Yi Ronglong , Chapter XIII by Yan Xiugang , Chapter XIV by Shao Hongliang , Liu Jishun and Yu Qixiang , Chapter XV by , Yi Ronglong , Huang Zeguang and Shao Hongliang , Conclusions by Zhou Yuqi and Yi Ronglong . Yi Ronglong is responsible for reviewing the entire manuscript of the book . Zhou Yuqi is in charge of the examination and approval of the book . Cheng Yuhua , Tang Huimin , Hang Xiuju , Li Yan , Jiao Hongyan and Song Xin assisted with computer – made map for this book .

Some important problems of petroleum theory , however , remain to be studied because of author's limited knowledge and uncompleted data collection . The deductions on new petroleum exploration domains and the predictions on petroleum exploration and development prospects in China might be modi-