

The Resources of China's Oil Shale and the Prospect of its Exploitation and Utilization

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Preface

- **High oil price makes shale oil competitive in the world**
- **The resources of shale oil are rich in China, and the technique and apparatus are well developed**
- **China's oil shale industry is stepping into a golden stage of fast development and shale oil will be one of the major substitutes for conventional oil & gas.**



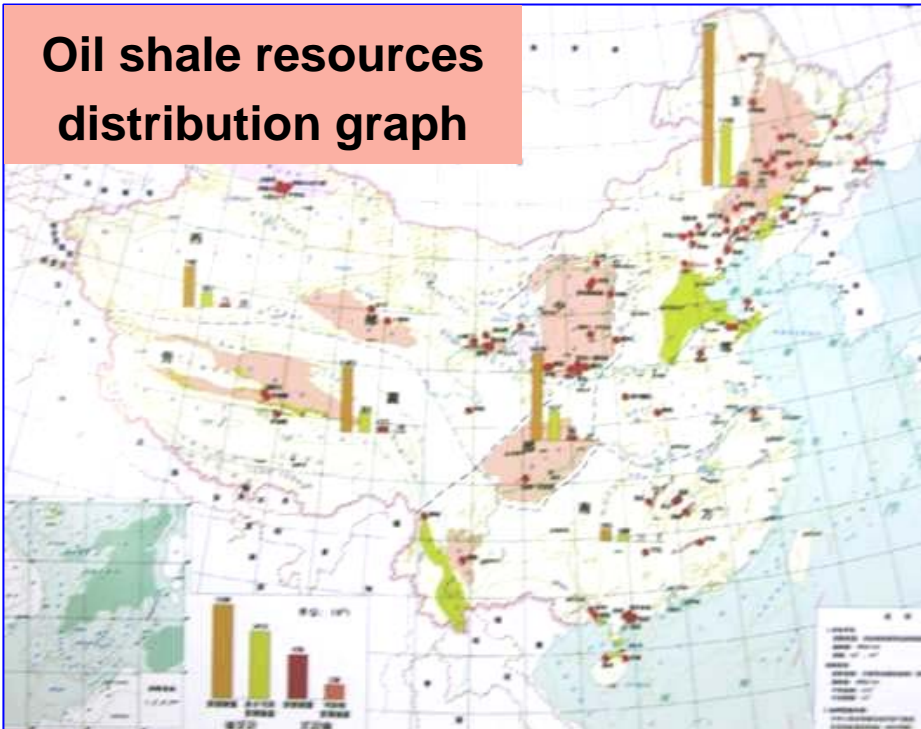
Outline

- ◆ **Oil shale resources in China**
- ◆ **Activities in exploitation**
- ◆ **Oil shale resources of PetroChina**
- ◆ **Prospects for development and use**



China is rich in oil shale: there are over 80 oil shale deposits which are located in 22 provinces, 47 basins.(Liu Zhaojun,2006)

Oil shale resources distribution graph

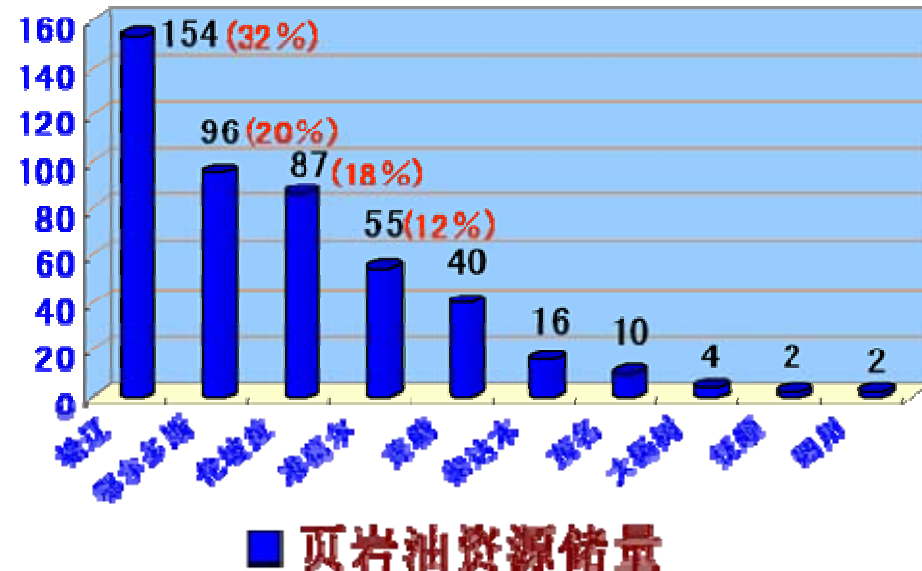
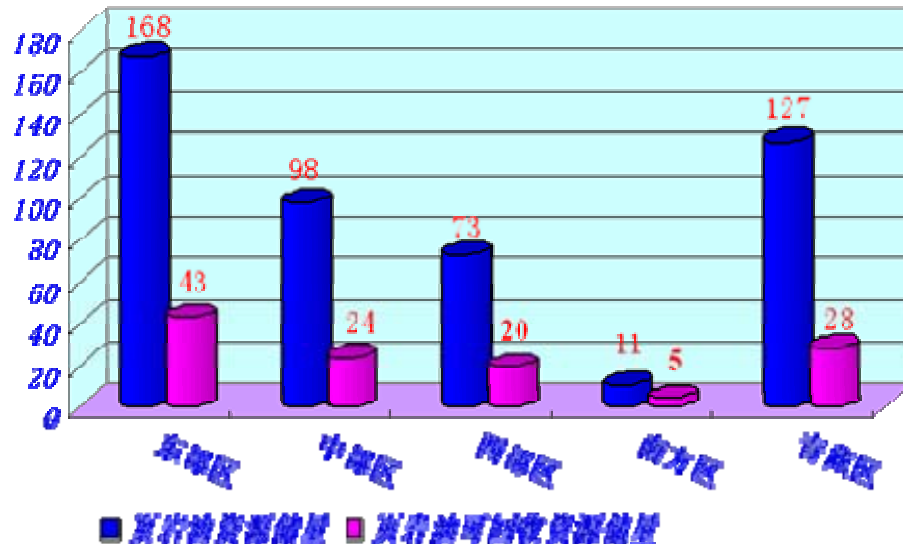


According to the Ministry of Land and Resources, P.R.China, Oil shale resources in China comprise 719.9 billion tons, shale oil resources are 47.6 billion tons.

- MLR of P.R.C (2006)



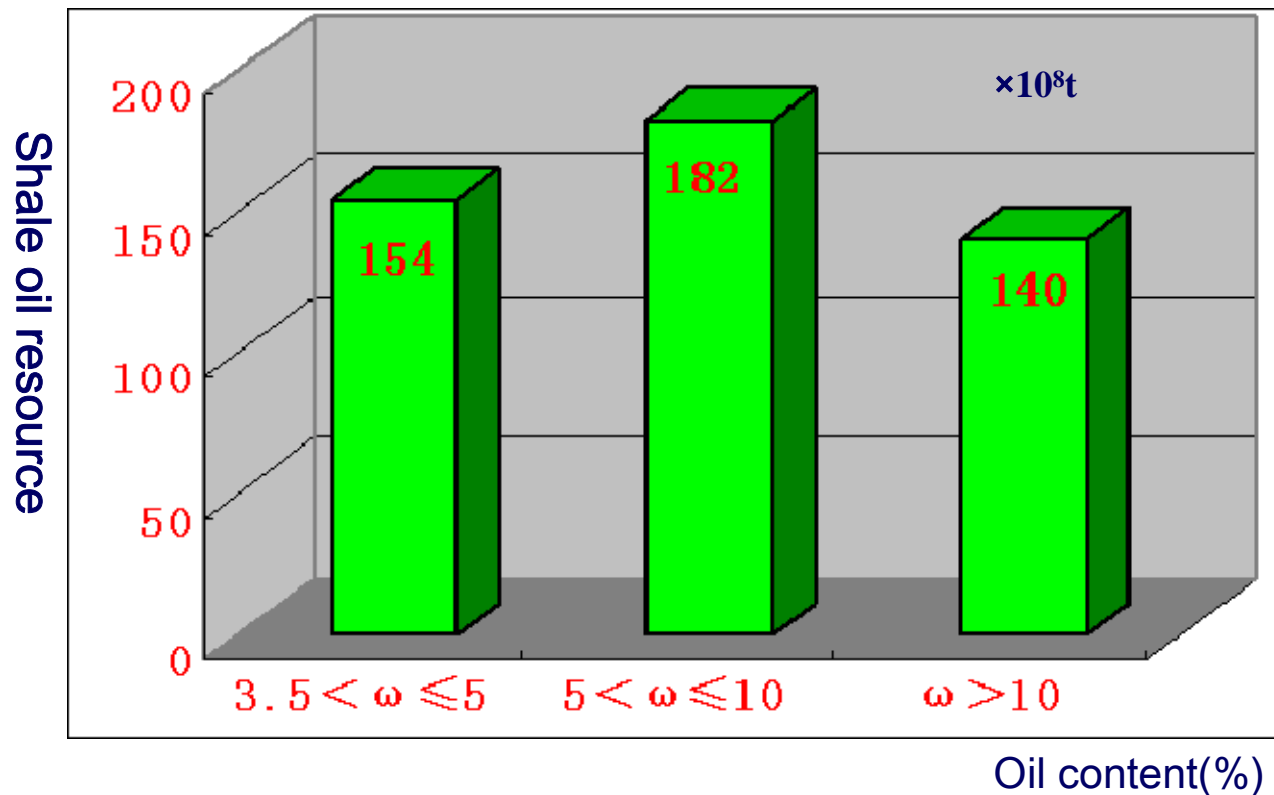
Oil shale is mainly distributed in the eastern part, the central part and Qinghai-Tibet in China. The shale oil resources of the eastern part are 35% of the nation's total.



Main basins: SongLiao basin, Ordos basin, Lunpola basin, Junggar basin etc.

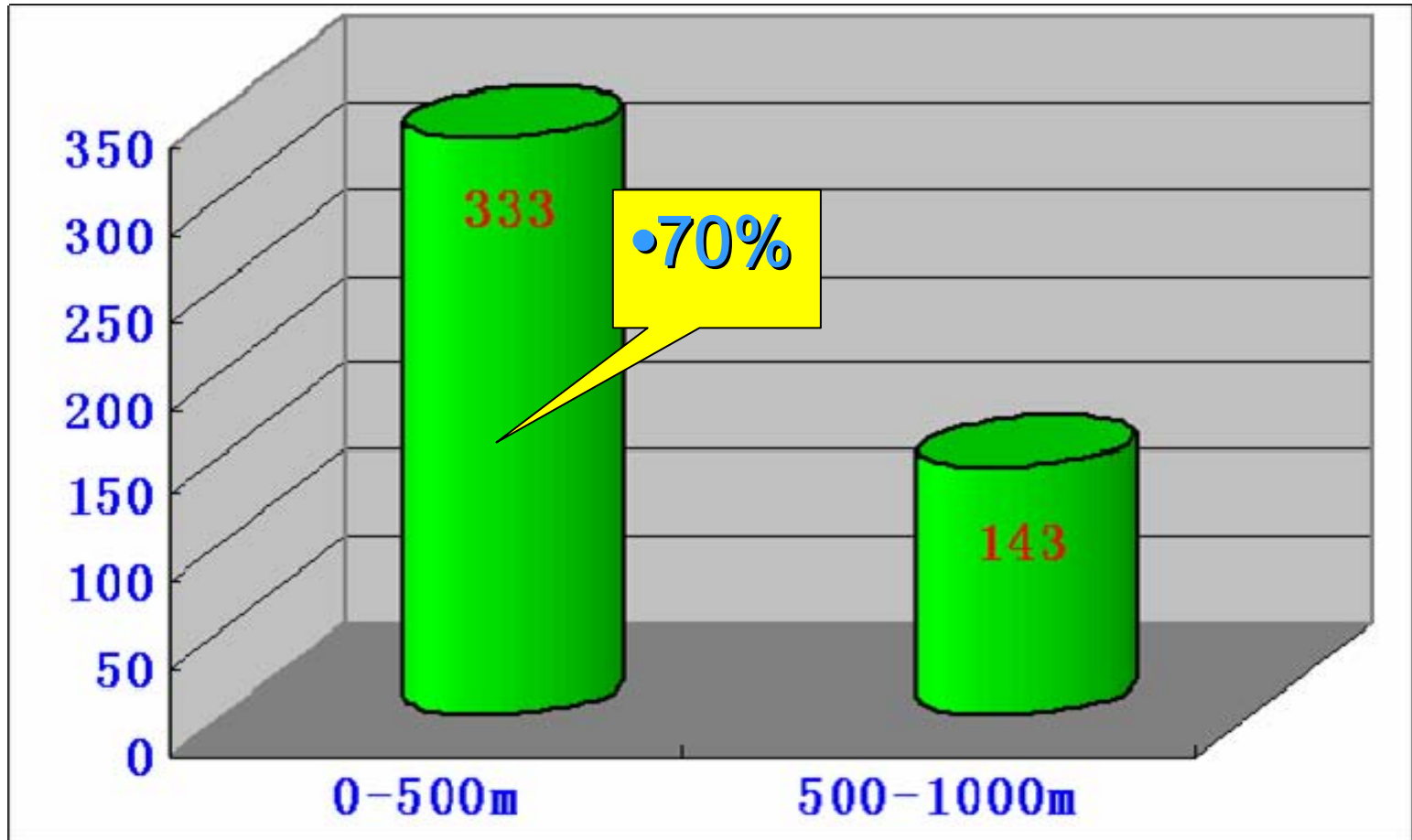


China has total resources of 47.6 billion tons of shale oil, comprising 18.2 billion tons of shale oil with an oil content of 5%-10%, about 35% of the total, and 14 billion tons with an oil content of more than 10%, about 29% of the total.





Depth of oil shale in China



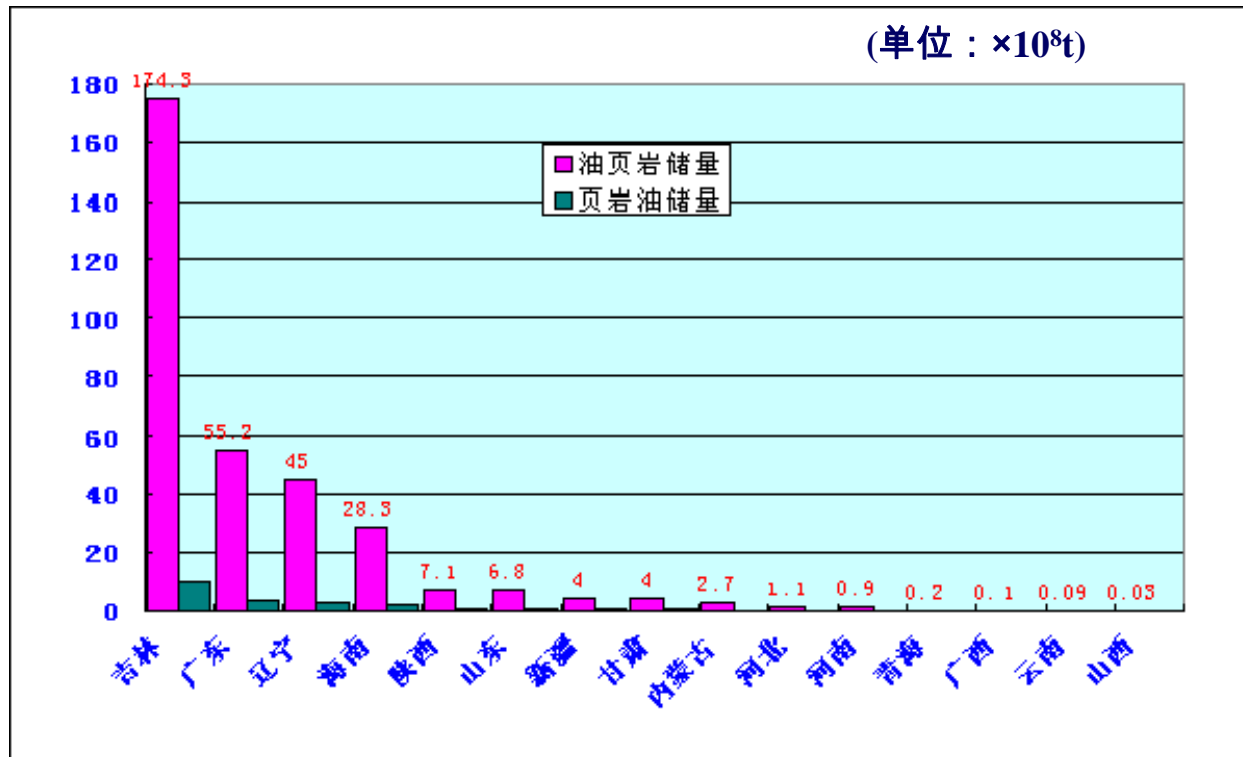
Burial depths of oil shale in China are mainly between 0 and 500 meters. 33.3 billion tons of shale oil, about 70% of the total is within this depth range.



Proved oil shale reserves

The proved oil shale reserves are 33 billion t which is mainly distributed in the Northeast and Middle South of China, with 52.83%, 16.72%, and 13.65% of the total located in Jilin Province, Guangdong Province and Liaoning Province.

Oil shale reserves : 330.×10⁸t





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Activities in exploitation

Now the mined oil shale is applied to extraction of shale oil, generation of electricity and comprehensive utilization

Oil shale Refining : Started in 1928, it has been nearly 80 years. The annual production of shale oil reached the peak of 790 thousand tons so far.

Power Generation : Starting in the 1990s, the capability is 12,000 kW in 2002, and the capacity is increasing rapidly.

Comprehensive Utilization : Making use of shale ash to produce building materials, ceramics and extract precious metals, etc.



1、 The development and use of oil shale in Fushun

➤ The oil shale resource comprises up to 3.667 billion tons, and of shale oil, 215 million tons; the recoverable shale oil is 168 million tons.





Development and Use

- Fushun Oil shale plant produced 144,000 tons shale oil in 2005, and as two newly built retorts have come into operation in 2006, the total production reached 200,000 tons per year.
- Fushun Mineral Affairs Bureau intend to build a power station. The designed capacity is 115,000 KW, and it can provide 500 million KWh of power per year.





2、Development and Use of Oil Shale in Maoming

- About 16.5 billion tons of oil shale resource, of which the proved resource is 6.8 billion tons, and 1.0 tons of shale oil.
- In the early 1960s, two retorts and a 3-million-ton open-pit mine were built
- In the early 1970s, another 2 retorts were built , and the capacity reached 200 000 ton/a of shale oil
- Between 1961 and 1993, more than 2.70 million tons of crude shale oil were produced



Development and Utilization

- A thermal power station project was started. Its designed capacity is 270,000KW.
- A power station with 1.5 million KW capacity is in planning.



Maoming, Guangdong

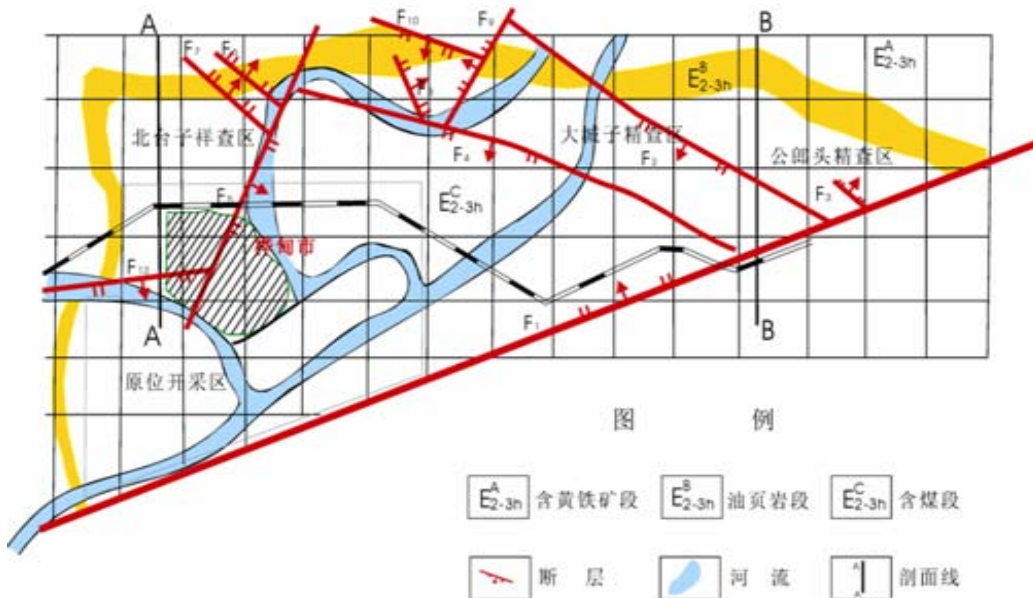


3、The development and Utility of oil shale in Huadian

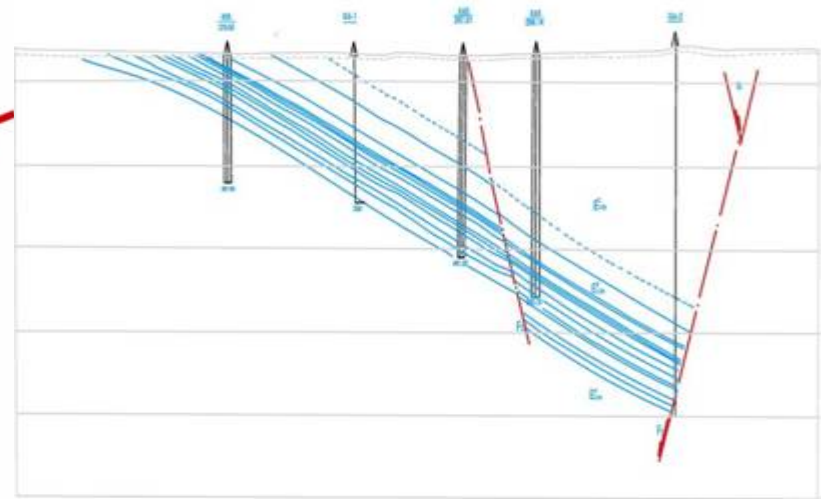
The oil shale resources in Huadian comprise about 705 million tons, and they can be converted to about 60.59 million tons of shale oil. The proved resources are about 550 million tons, and they can make 37.17 million tons of shale oil.

吉林省桦甸油页岩矿区地质略图

0 1 2km



第B-B勘探线地质剖面图





3、 Development and use of oil shale in Huadian

- In early 1970s, the fluidized bed combustion technology came into use, and the oil shale was used as fuel
- A thermal power station was built in 1992, and its capacity is 18,000 KW
- Shale oil production is more than 10,000 ton/a

Present Retort





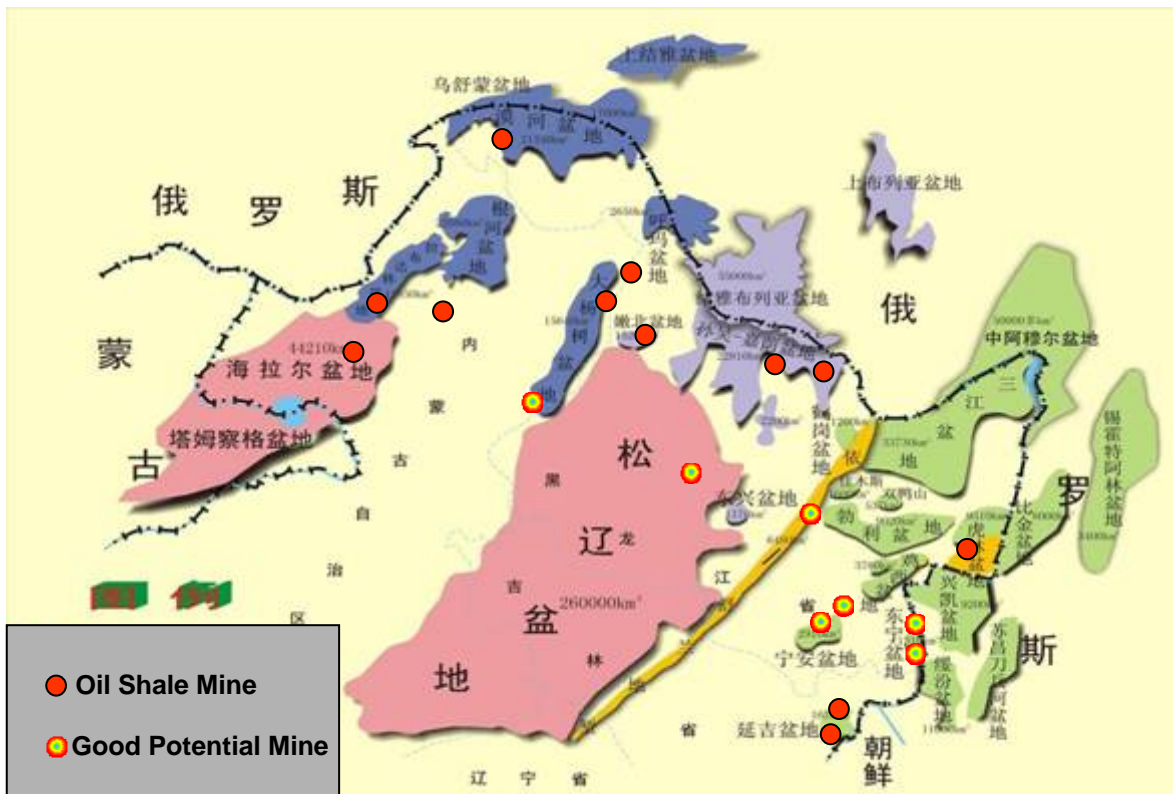
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Oil shale resources of PetroChina are mainly distributed in the Daqing area, Jilin area and northwest China. The total oil shale resources are about 531.1 billion tons, and shale oil is 22.2 billions.

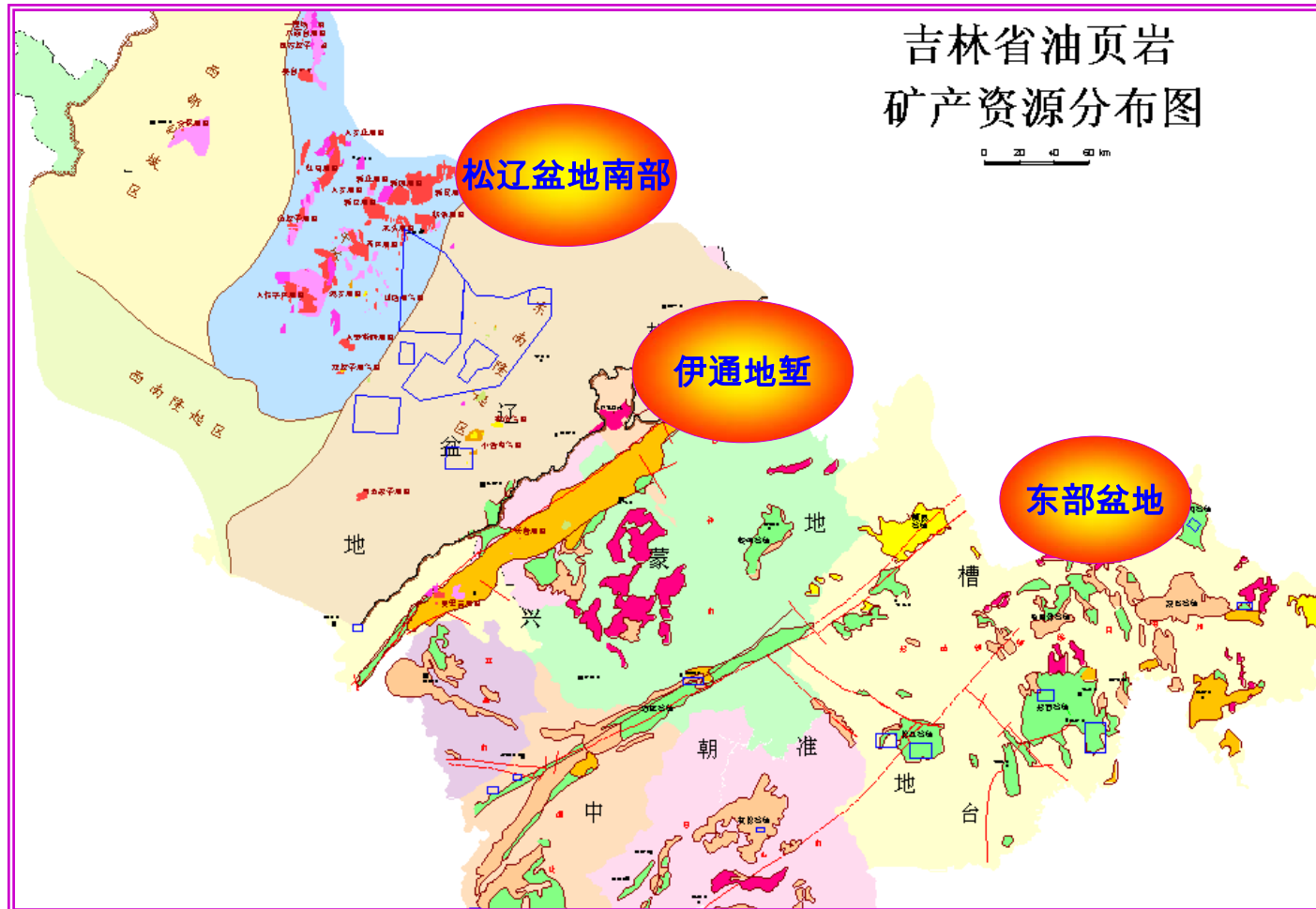
1. Oil shale resources in Daqing area



Daqing area has 19 oil shale deposits located in such 16 basins as Songliao, Yisu, Anning, etc. The oil shale resources is up to 310 billion tons, and the shale oil resources is 10.8 billion tons.



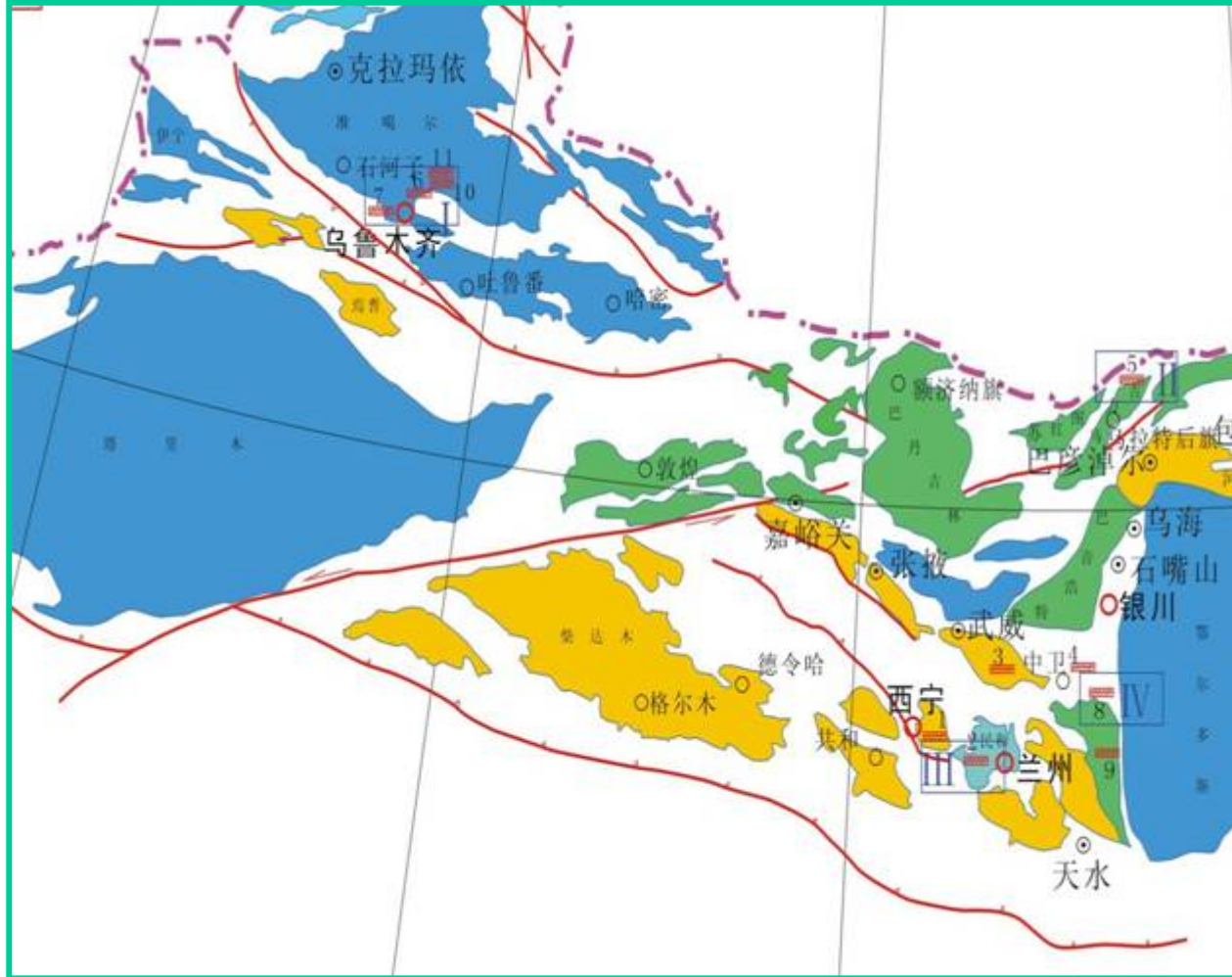
2. Oil shale resources in the Jilin area



To date, 20 basins are found to be rich in oil shale. The total oil shale resource in Jilin area is about 179.8 billion tons and the shale oil resource is 9.4 billion tons.



3. Oil shale resources in northwest China.



- There are 16 oil shale deposits.
- Total resource is about 41.3 billion tons which can be convert to 2.0 billion tons of shale oil.
- The proved resource is about 760 million tons.



Six interesting oil shale deposits

(1) Oil shale in Liushuhe Basin



Period :

Tertiary

Oil content :

3.7-17.2%, average 11%

Depth :

10 - 134m

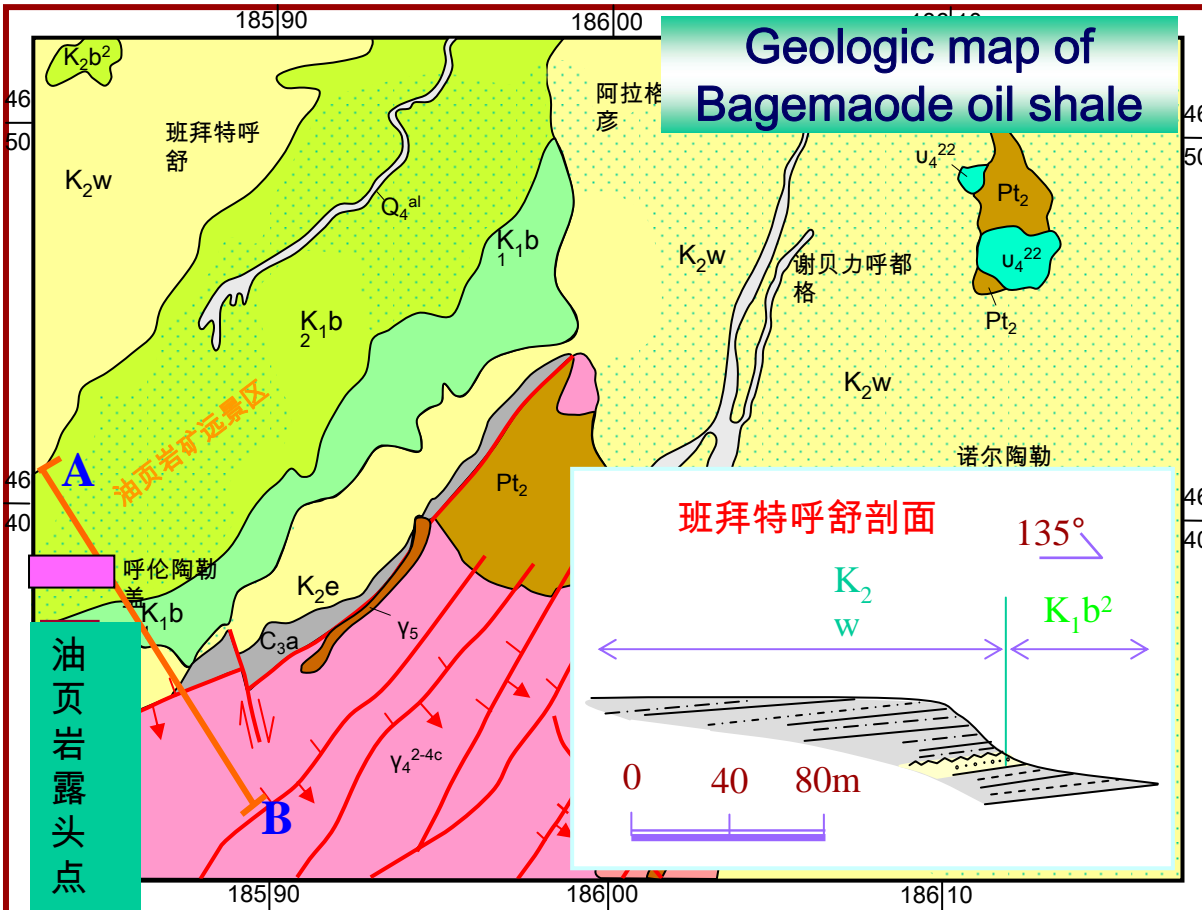
Thickness :

2-14.95m , average 6.5m

The oil shale in Liushuhe basin is more than 55.91 million tons. Oil reserve exceeds 5.50 million tons.



(3) Bagemaode Oil shale



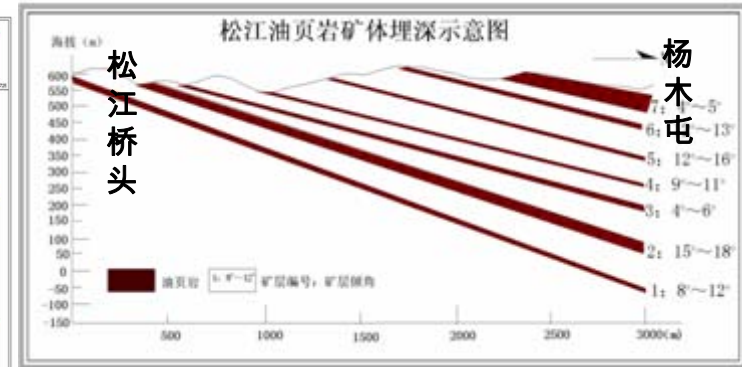
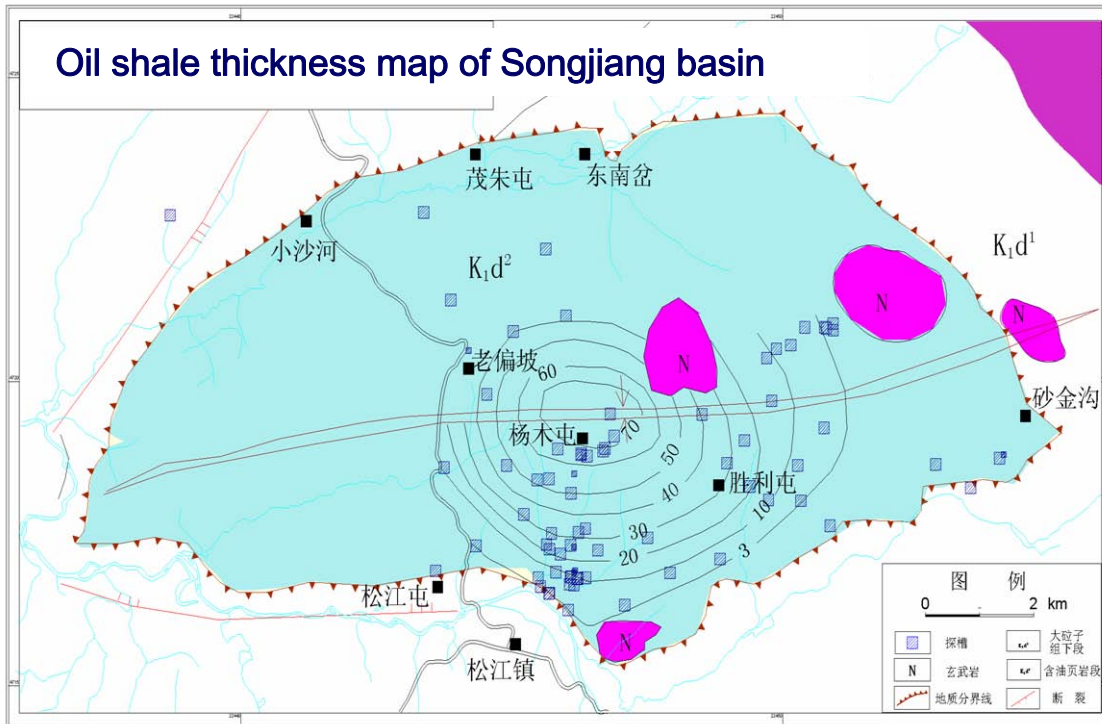
Period: Early Cretaceous
Depth: 49.4m
Oil shale resource: 33.2-6.62 billion tons
Oil content: 5.93-19%



Bagemaode Oil shale lies in Yin'e basin. The area covers 50 ~ 100km². The oil shale resource is 6.6 billion tons. The reserves is 400 million tons.



(4) oil shale in Songjiang Basin



Oil shale thickness of Songjiang basin ranges from 11.6m to 73m.

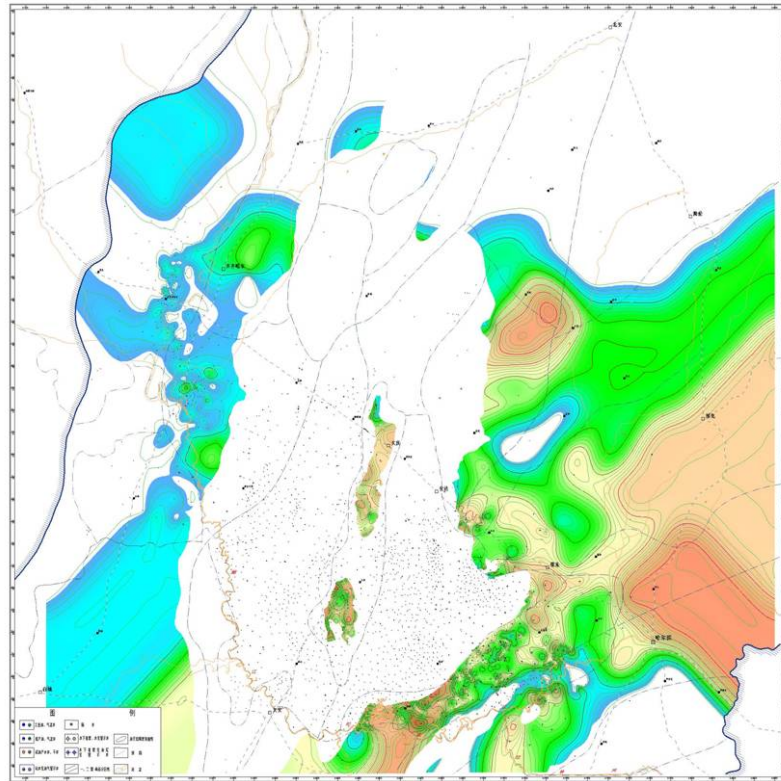
Oil contents is 5% to 12%.

Oil shale resources reaches 2.328 billion tons and Oil reserves exceeds 100 million tons.

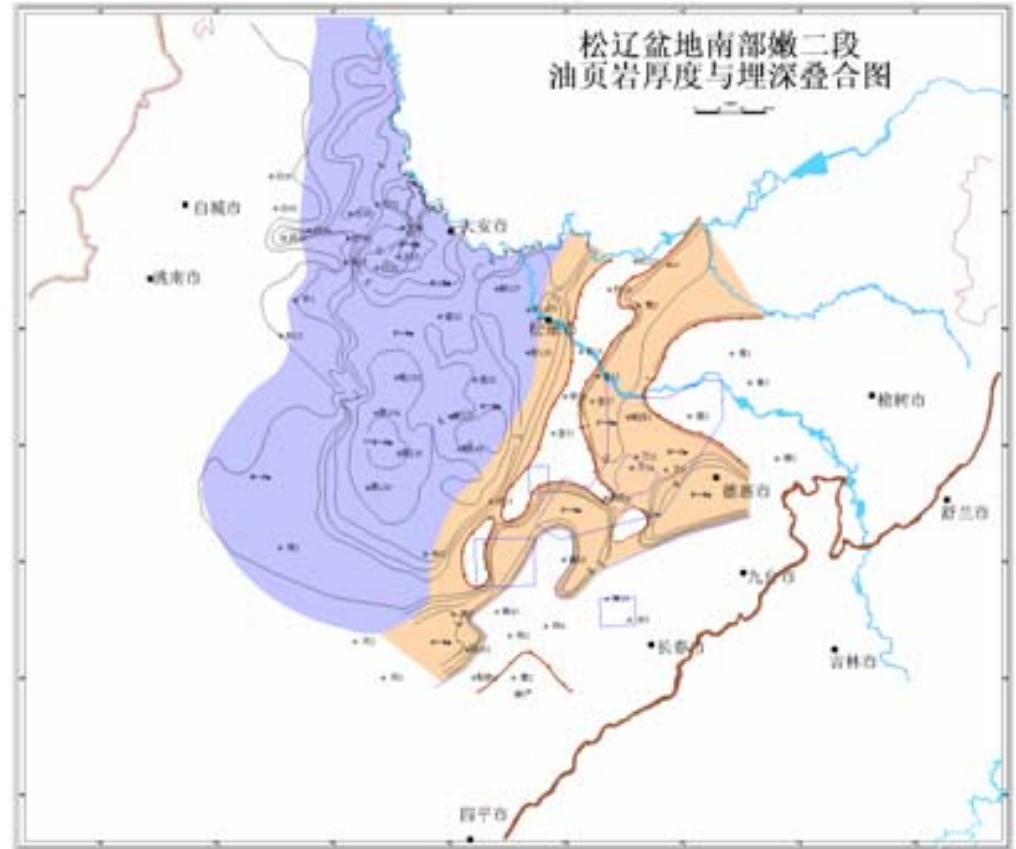


(6) Oil shale in Songliao Basin

松辽盆地北部嫩江组油页岩厚度图



松辽盆地南部嫩二段油页岩厚度与埋深叠合图



Thickness is 15 ~ 20 m and the maximum is 31.4m.

The burial depth is 10 ~ 2700m.

The oil content is 9.14%.

The total oil shale resource is 460.7 billion tons and the oil reserve is 19 billion tons.



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Prospect of oil shale development

- **Opportunities**

- **More needs for energy**

- The soaring of the price of crude oil and the shortage of energy make the need for oil shale increase.

- **Lower cost**

With advancement of technology, the cost of oil shale development is becoming lower. The cost of Fushun shale oil ranges from 800 yuan/t to 900 yuan/t.

- **Comprehensive utilization**

- comprehensive utilization of oil shale will bring additional profits



The soaring of the price of crude oil and the advancement of exploitation and utilization technology of oil shale in recent years have brought about historic opportunities for the development of oil shale industry in China.

Luozigou shale oil plant in Jilin Province

200,000 tons shale oil and 5,000 kg noble metal can be produced a year when the project is completed.

Huadian power plant in Jilin province

The second stage of the project is on going .

The total aim is to generate 18,000 kWh of electricity , supply 14,400kWh a year, supply 3.10 MJ of heat and produce 300,000 cubic meter of building materials.



PetroChina, one of the largest companies in the PRC in terms of sales, is engaged in a broad range of activities related to oil shale, including:

1. Exploration and evaluation
 2. Research on technology of exploitation and utilization, such as ICP
 3. Development & production of shale oil
- **Petrochina has a plan to produce 1 million ton shale oil a year by 2020**



Now there are a lot of company in China engaging in the exploration and development of oil shale. They mostly want to get shale oil. The annual production of shale oil is anticipated to reach 5 million ton, 10 million ton, 15 million ton, 20 million ton in 2020, 2030, 2040 and 2050 respectively.

The End