New development of Chinese oil shale activities

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There are new oil shale activities in China every year. For instance, shale oil production has been increasing annually.

Last year, total shale oil production was around 550,000 t.

This year, according to preliminary estimates, total shale oil production will be more than 600,000 t (about 4 million barrels).
Oil contents of some oil shales used in commercial retorting operations in China are as follows:

<table>
<thead>
<tr>
<th>Location</th>
<th>Oil Content (%)</th>
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</thead>
<tbody>
<tr>
<td>Fushun</td>
<td>6.5%</td>
</tr>
<tr>
<td>Baipiao</td>
<td>5%</td>
</tr>
<tr>
<td>Huadian</td>
<td>10%</td>
</tr>
<tr>
<td>Longkou</td>
<td>12%</td>
</tr>
<tr>
<td>Dongning</td>
<td>8%</td>
</tr>
<tr>
<td>Yaijie</td>
<td>10%</td>
</tr>
<tr>
<td>Wangqing</td>
<td>6%</td>
</tr>
</tbody>
</table>

There are 7 major oil shale retorting facilities in China: Fushun, Huadian, Wangqing, Baipiao, Longkou, Yaojie and Dongning, located in 5 provinces.

The Fushun retort (or modified Fushun retort) is the dominant retorting technology used in China.

Of these oil shale deposits, Longkou has the highest oil yield, while Baipiao oil shale yields less than 5 wt%.
In Fushun, there are two oil shale retorting plants.

- One has 120 Fushun-type retorts (100 t/day).
- Another has 100 Fushun-type retorts (100 t/day).
Fushun, Liaoning Province, Northeast China

Fushun

- The total shale oil production of these two plants is about 350,000 t per year.
- The total annual oil shale processed is about 10 million tons.
An ATP system, imported several years ago, has been constructed and installed in Fushun.

At present, the Fushun ATP plant is undergoing preliminary testing.
At the beginning of 2010, a new shale oil refining project started in Fushun.

It will produce gasoline, diesel and other chemicals by upgrading shale oil using hydrogenation.

Hydrogen will be produced by coal gasification.

Total investment for this project is ~$200 million (US).

The construction and installation are expected to be completed in 2011.
In Wangqing, Longteng Energy Company has built 40 Fushun retorts to produce about 50,000 t shale oil per year.
An oil shale power plant was constructed here in 2009.

There are two circular fluidized bed boilers with a vapor generation capacity of 35 t/h or an electrical generation capacity of 6000 kW.

Particulate oil shale (<10 mm) is used for electricity generation

Lump oil shale (10-75 mm) is used for shale oil production.
The Longkou Coal Mining company operates an oil shale retort plant that produces 60,000 tons of shale oil per year.

The plant has 20 Fushun retorts as one block.
Longkou, Shandong Province, East China

- Last year, the first 10 retorts were completed.
- This year, another 10 retorts were completed.
- An additional 20 modified Fushun retorts will be installed in 2011.
Oil shale is a by-product of lignite mining.

Shale oil yield is highest in China.

The plant is near the sea and the shale oil is directly sold as marine fuel oil.

The company plans to import Galoter technology from Estonia in 2011.
In Yaojie, the Gansu Coal company, in cooperation with the Sanjiang Coal Chemical company, has installed 8 oil shale retorts.

The plant has been successfully operated since July 2010.
The retort is a square gas combustion system.

The retort has a cross-section of 3.0 m × 6 m and is 7.5 m tall.

The retorting gas mixes with air and enters the bottom of the retort where it is combusted to provide the heat for retorting.
The retort can process 600 tons of oil shale per day.

Oil shale is a by-product of coal mining.

The particle size used in the retort is 8-60 mm.

The shale oil recovered using this retort system is greater than 80% of the Fischer Assay yield.
Sanjiang Coal Chemical Company successfully developed the square retort for coal retorting to produce coal tar and coke, with a capacity of 300 tons per day.
This type retort has the advantages of simple structure, low capital cost, and easy operation.

This retort has been widely used in western China since 2000, and has been exported to Kazakhstan for coal retorting.

The modified square retort is now being successfully used for oil shale retorting.
In Huadian, an oil shale power station has been operating for 14 years. It consists of three circular fluidized-bed boilers for combusting oil shale. Each boiler has a 65 t/h vapour capacity.
In Huadian, there are 3 private companies involved in oil shale utilization. All together they are using 20 Fushun-type retorts to produce 50,000 tons of shale oil per year.
Hongsheng Energy Company finished the construction and installation of 12 modified Fushun retorts in July 2010.

Each retort can process 300 tons of oil shale per day.

The plant is currently undergoing pre-startup testing.
In this retort, there are two sections;

- The upper section is a cylinder type, similar to the Fushun retort, for oil shale retorting
- The lower section is a square compartment used for semicoke cooling

Retorting gas is indirectly heated in the tubular furnace and recycled into the upper section to heat oil shale.

- The semicoke will be used as the feedstock for a power station.
- Shale ash will be used as building material.
During trial runs, a problem with the tubular furnace was found.

The tubular furnace cannot provide sufficient heat to the retorting gas to reach the target operating temperature of ~700°C.
In Beipiao, Liaoning province, the Beipiao Coal Mining Co. constructed 40 Fushun retorts at the beginning of 2009.

50,000 tons of shale oil is being produced per year.
Because of its low oil content (~5%), only Fushun retort technology can be used for Beipiao oil shale.

After two years of operation, no problems have been found.

The oil shale is mined in open pits, making the plant economically feasible.
In Beipiao, Kangping Coal Co. is constructing 60 Fushun retorts. The facility is scheduled for completion in 2011.

Shunjiu Oil Shale Co. also plans to construct 44 Fushun retorts.

Fuxin Coal Co. will construct another 40 Fushun retorts.
In Suiyuan, Guangdong province, one circular fluidized-bed boiler for combusting Maoming oil shale was constructed in 2008 with a capacity of 65 t/h vapor generation.
In Maoming, the Guangdong Power Group plans to build a power station that will use oil shale in 2011.

This project has the permission of the National Environmental Department.

In phase one, an investment of ~$600 million (US) will lead to a 420,000 kW facility. Annual oil shale use will be ~6 million tons.

The total investment will be ~$1.4 billion (US) and the final capacity will be 1.26 million kW using about 20 million tons of oil shale per year.

A circular fluidized bed will be used for power generation.
Daqing Oil Company (CNPC) is constructing a commercial plant with a daily processing capacity of 2,000 tons of oil shale using a solid heat carrier retort. The project will be finished in 2011.
In Harbin, Heilongjiang Province, the China National Coal Corporation plans to build a fluidized-bed oil shale retorting pilot plant with a capacity of 2,000 tons of oil shale per day.
Professor Jialin Qian, as chief editor, published a book in June 2010, written in English.


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