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POTASH DEVELOPMENTS AT QINGHAI SALT LAKE

by

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Geographical Situation and Climate

Golmud (*Geermu*) is a new industrial city on a plateau in the mid-west part of Qinghai province. Close to the borders of the **Gobi Desert**, the **Kunlun Mountains** and the **Chaerhan Salt Lake**, the city is a dusty and desolate place. With a population of a mere 140,000 habitants and at 2,800 meters above sea level, the city has also, surprisingly, the largest area in the world, encompassing nearly 49,000 square kilometers.

The city's size is largely a result of two related factors: Government relocation policies and the **Chadamu Basin**. Not far away from town, the basin is an area rich in mineral resources that is said to contain over 50 kinds of salts, non-ferrous metals and large reserves of crude oil and natural gas. The remote town of Golmud is well known due to the huge quantities of potassium, in the form of potash that can be found near to the town. The former Qinghai Potash Plant (or Qinghai Jiafei Chang), right now called Qinghai Salt Lake Industry Group Co. Ltd is located at **Chaerhan Salt Lake**, about 60 km from town.

Golmud belongs to a plateau climate, with mild summer weather, but with freezing winters. The average annual temperature stays around 4.3° Celsius, with extremes ranging between + 35° C and -33.6° C. In addition, Golmud is also characterized by its dry climate - the annual average precipitation is 50mm and evaporation is 3000 mm annually.

Mineral Resources

Qinghai Salt Lake Industry Group Co. Ltd (QSLIC) is the largest potash and magnesium production base in China and is located at the mid-west of Chaerhan Salt Lake in Chaidamu Basin. Chaerhan Salt Lake is the largest soluble potassium and magnesium deposit bed in China, which is 168 km long from East to West and 20 to 40 km wide from South to North with a total area of 5,856 km².

Chaerhan is the Mongolian translation of “salt world”. The Chaerhan Salt Lake contains all kinds of natural resources, totaling about 60 billion tonnes (Bt), of which sodium chloride reserve account for 145 million tonnes (Mt), equating to 97% of the country’s total prospected salt resources. Magnesium chloride and lithium chloride account for the bulk of the reserves in China that are estimated at 1.65 Bt and 8.2 Bt respectively. Chaerhan Lake also contains rare elements such as Boron, Bromine, Iodine, Rubidium, Cesium and etc. The exploration and exploitation of Chaerhan Lake resources has widely developed in recent years. The Chaerhan Salt Lake is a strategic location for developing the salt chemical industry.

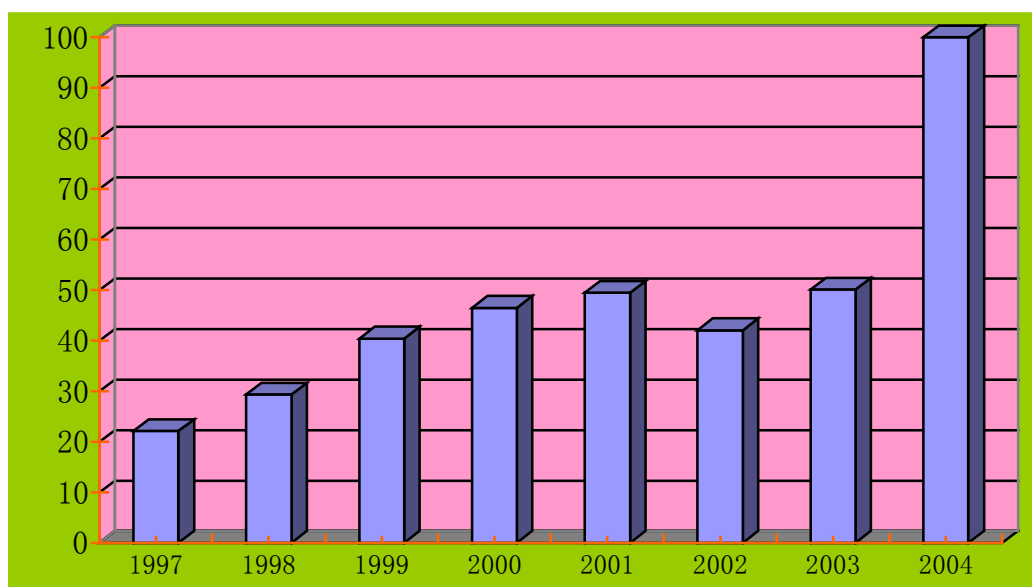
Qinghai Salt Lake Industry Group Co. Ltd.

The main potash producing subsidiaries of QSLIC are listed in table 1, along with their respective capacity:

Table 1: Subsidiaries of QSLIC

Subsidiaries in Qinghai	Annual Capacity metric tonnes KCl
Qinghai Salt Lake Developing Co. Ltd.	1,000,000
Qinghai Salt Lake Potash Co. Ltd,	340,000
Qinghai Salt Lake San Yuan Co. Ltd	100,000
Qinghai Salt Lake Science & Technology Developing. Co. Ltd	50,000
Qinghai East Potassium Chloride Industry Co. Ltd.	25,000
Qinghai Salt Lake Magnesium Co. Ltd.	1,500 t/a MgCl ₂
Qinghai Salt Lake Wengtong Chemical Co. Ltd.	New project: 2006/07

Potassium chloride production at QSLIC for the period from 1997 to 2004 is shown on the figure 1 (unit in 10,000 tonnes of KCl). Potash production in 1997 totaled 167 Kt KCl and reached about 500 Kt KCl in 2003. Potash production is projected at 1.0 Mt KCl in 2004.



Potash Developing History

China is a very large agriculture country and has very limited resources of potash. The proven potash reserves are mostly located in Chaerhan Salt Lake. Another potash deposit is located in the Xingjiang Municipality Region, which contains about 500 Mt of potash. Until now, its development is still in the stage of a pilot plant.

The exploitation of the potash reserves of Chaerhan Salt Lake began in 1958. At that time the technology was very poor and not available; therefore, labor with hands and shoulders was the prelude of the new China's potash industry. After 36 years of production and continuous research, the traditional potash production process was developed. On the basis of new technology, the first phase project with a design capacity 200,000 t KCl was launched in May 1986 and production started in 1993. In the same year, the first phase project and the old processing plant merged their operations into the former Qinghai Potash Plant (QPP). In 1997, the former Qinghai Potash Plant was wholly restructured into the independently state-owned Qinghai Salt Lake Industry Group Co. Ltd. (QSLIC) and then formed the basis of the main company and its subsidiaries.

The subsidiaries are independent from the Group Company (QSLIC), which holds a controlling share in all its subsidiaries. QSLIC is the center for the funding of projects and for any decisions on key issues. The subsidiaries are the centers for controlling the costs of production and assume the sole responsibility for their profits or losses. In 1997, the potash production facilities of QSLIC were reorganized into Qinghai Salt Lake Potash Company Ltd and its stocks were listed on the Shenzheng Stock Exchange under the name of "Salt Lake Potash".

QSLIC was the first potash producer in China. Of course, in the early years, the research institutes were not very familiar with potash engineering. After the first project was put into the production with a capacity of 200,000 t KCl, a lot of problem emerged, such as long production periods, technical failures and unsuitable equipments. For example, thickeners and flotation cells were too small. As a result, the facility could not reach its design capacity and the product quality was very poor.

In 1997, based on many years of research and trials at a pilot plant, QSLIC decided to modify its 200,000 t-facility with the installation of the cold crystallize process in order to reach the original design capacity. We were very lucky and we successfully carried out the whole process modification. The production process then became reliable and stable. The most important result was a better understanding on the ways to control potash production and get high quality products. Nowadays, QSLIC operations have a total capacity of 500,000 t KCl and production output is increasing every year.

There are three types of production process: traditional flotation; brine conversion and cold crystallization process (CCP). Particularly, after the brine conversion process facility was connected to the cold crystallization process facility, the potassium resource has been collected from the dissolved mother liquid and residue potassium during the CCP production and increased its recovery.

So now, QSLIC can produce high-grade potash products from this process. After several modifications were carried out on the 200,000-t facility, QSLIC stepped into a new development stage and constructed a new 100,000 t-facility, benefiting from its experience in the processing of potash. This facility was used as the pilot plant for the second phase project, which was planned with a capacity of 1.0 Mt of potash.

The second phase project has been listed as one of ten first mineral projects being developed by the State in the West of China and received high attention from the Central Communist Party and State Council. The project began in May 2000 and was finished at the end of 2003. Since the beginning of 2004, close to 300,000 t of potash was produced while we are planning to reach 500,000 t in 2004. The total potash production plan of QSLIC in 2004 is 1.0 Mt KCl. From the half year of production in 2004, we found out that the drying design and dryers have some problems and we are reconstructing the drying system. The whole process has shown excellent results, production costs are low and product quality is much higher than during the first phase project.

Other Main Potash Producers in Qinghai

QSLIC is the first potash producer in China and represents the potash production level in China.

In many years' production, QSLIC owns a lot of production experience and trained many good engineers and staff after done a lot of modification, so many small private companies employed these retired or job-changed engineers from QSLIC to run potash production. With the help of the huge market and low cost and price, these private companies (around 30) developed so quickly in recent years. Their potash output in 2003 was around 500,000 t KCl. Some of the other large companies are listed in table 2:

Table 2: Other Main Potash Producers in Qinghai

Companies	Annual Capacity metric tonnes KCl
Han Hai Enterprise (also called Qinghai Germu Kalium Co. Ltd.)	100,000
China-Tibet Railway Co.Ltd.	20,000
Lan Kong Potash Co. Ltd	30,000
Chaidamu Mineral Chemical Plant	30,000
Golmud Qingfen Potash Co. Ltd	20,000
Qinghai Lenhu Potash Group. Co. Ltd	150,000

Medium- and Long Term Development Plans

After the completion of the second phase with a capacity of 1.0 Mt KCl, the total assets of QSLIC will be valued at around 15 billion RMB and the total potash production capacity will be up to 1.5 Mt KCl annually, which will account for one-fourth of the domestic potash consumption, the rest being supplied from imports. At that time, the income from potash sales will reach 1.6 billion RMB and other income from other products and business will be around 0.2 billion RMB. The total income will reach 1.8 billion RMB annually and our taxes contribution will be about 0.2 billion RMB.

When the potash production capacity is fully developed, the Group Company will take further steps to increase the use of the Salt Lake resources in order to combine salt chemicals with petrochemicals. A new plan has been proved by the Qinghai Government, which includes two stages. The first phase of the project is currently under design and will kick off at the end of this year, for completion by the end of 2006. The second phase of the project will continue after the first phase is completed.

The new project under Qinghai Salt Lake Wengtong Chemical Co. Ltd. will cooperate with other companies in order to expand the economic benefits of all other projects. In this way, the resources advantage in Chaerhan Salt Lake will be converted into an economical advantage. The following is a list of all the components involved in this new project (table 3):

Table 3: New projects under the first phase under construction

Projects	Annual Capacity metric tonnes
KOH	60,000
K ₂ CO ₃	70,000
NH ₃	150,000
UREA	240,000
PVC	100,000
POWER PLANT	2 × 50,000 KW

We believe that the strategies for the exploitation of the resources in the Western region by the Central Government will give an historic opportunity for the large-scale development of Salt Lake resources. QSLIC will tackle this opportunity with a new attitude involving science and innovation in order to build a vivid large-scale salt chemical Group and contribute to the economic development within the Qinghai Province.