

## BASIC FACTS ABOUT SHAN-DONG TAI-AN NATURAL SULPHUR MINE

### Geological Conditions.

Shan-Dong Tai-An Zhu-Jia-Zhuang Natural Sulphur Mine is located 35 miles southeast of Tai-An City, Shan-Dong Province. The sulphur bed belongs to Serial III Lake Sedimentation, embedded in thin strata of stratified marl and strata of shale-like lime-containing, dolomite-containing and gypsum-containing marl. The sulphur mine is made of alternating sulphur and non-sulphur strata of various thickness. From geological survey, the natural sulphur mine centers at Zhu-Jia-Zhuang Village, stretches out 11 kilometers in the east-south [should be east-west] direction and 5 kilometers in the north-south direction, and occupies 43.6 square kilometers. The sulphur deposit is 180-500 meters underground and the alternating sulphur strata spreads out vertically over a distance about 180 meters. The accumulative thickness of the sulphur strata is about 66 meters. The average sulphur concentration is 9.9% and the sulphur deposit is about 290 million tons, considered the largest natural sulphur deposit in China.

According to the sedimentation sequence of mineral ores and the thickness of sulphur in the sulphur strata, it can be grouped into three mine belts from bottom up. The first belt is the largest among three and it has the largest accumulative sulphur thickness. The second belt ranks the second. The third belt has only scattered sulphur deposits. After drilling seven "cross-shaped" geological test drilling holes on the 0.12-square kilometer testing site centered at the 2R16 drilling pit on the southwest skirt of the sulphur mine, 37 sulphur strata was discovered. The thickness of a single sulphur stratum ranges from 0.17 meter to 4.27 meter. The geological structure of the high-quality sulphur strata 9-13 is not stable, and the stratum thickness is non-uniform. The mineral deposit is mainly crystalline sulphur containing high levels of heavy oil, bitumen and hydrocarbons. The sulphur stratum contains high levels of clay, including E-Lee Stone, montmorillonite and kaolinite.

The hydrological conditions of the mine are fairly simple. The top of the mine belt is a pressure-bearing porous permeable water-containing stratum. The mine belt itself is pressure bearing water-containing strata. The average porosity is 10.7%. The permeability is 0.00025 meter/day based on the tests done on the K14 drilling hole located on the east skirt of the mine. The bottom of the belt] is an impermeable stratum.

### Preliminary Mining Conditions

Preliminary test mining began in October of 1980, including the following:

(1) Geological Study. The study included geological and geophysical studies, mineral determinations and physical property evaluations.

(2) Laboratory Tests. Underground melting simulation, treatment and utilization of extracted underground water, corrosion inhibitors study, sulphur purification, and under pit fluid-thermal equilibrium analysis were conducted.

(3) On-site Pilot Testing. Cold injection and hot injection, mining process, engineering and product refinement were tested and evaluated.

Iraqi, American and Polish experts conducted on-site inspections. Polish experts twice participated in on-site mining in 1984 and 1985. 8.5 tons of curd sulphur was successfully mined in September 1984. Due to the difficulty of muddy conditions caused by the thick heavy mud and the lack of capital, pilot mining was terminated.