

FENG Jianliang and BAI Fuyi, 2014. Comprehensive Development and Utilization of Saline Lake Groups in Dingbian, Shanxi Province of China. *Acta Geologica Sinica* (English Edition), 88(supp. 1): 133-134.

Comprehensive Development and Utilization of Saline Lake Groups in Dingbian, Shanxi Province of China

FENG Jianliang and BAI Fuyi

Shaanxi Yanchang Petroleum Dingbian Salt Chemical Industry Company, Dingbian County, Shanxi Province, 718600

The Dingbian Saline Lake groups are in Dingbian County, northwest of Shaanxi province, and located on the border area of the Loess Plateau and Maowusu Desert in Northern Shanxi. It's altitude is more than 1300m. The bedrock of Saline Lake is Central River group stratum of Cretaceous, and the lake Basin is developed on the basis of bedrock Valley. It is the only lake salt production area in Shanxi Province with the mining history over 2000 years, and made great contributions in China Sino Japanese War and the liberation war in the 1930s and 1940s. Total Salt frost area of the lake groups is 1600km², and the catchment area is 1866.8 km². The Large and small 14 Saline Lakes in the region are regularly distributed in an arc of southwest to northeast direction, 60km long, where the lake area is 98 km². It's typical continental climate, dry, westerly, little precipitation (annual average 319.3mm) and concentrated (June to September), while high evaporation (annual average 2225.2mm). The GouChi Saline Lake and the HuaMaChi Saline Lake in the middle part of the Lake Depression are the main deposit occurrences and the most representative mining areas. The components are of NaCl and Na₂SO₄, associated with MgSO₄ and MgCl₂. The brine is subtype of Magnesium sulfate, which is in NaCl precipitated phase under normal temperature, and mirabilite precipitated below 0 °C in winter. The mineral deposit is buried deep under 10m, with thick coverings of sludge (usually more than 3m), and much impurities of sand. It's not suitable mined by mechanical or directly manual, just only suitable for solution mining.

The basic condition of dissolving mining method for solid deposit of Saline Lake is the technical possibility and economic rationality of the useful minerals in the deposit transforming into flow state under the action of solvent water, enhanced dissolution is direct or indirect, rapid transformation and collection of useful minerals. The

process technology measures are described in the article that in the Saline Lakes of GouChi and the HuaMaChi, machinery like salt dredgers apply force and effects by means of strengthening catalysis, promotion and booster of water according to the ore body conditions to exacerbate reactions and improve conditions of dissolving, and the process of solid mineral under the mud and sand transforming to flowing liquid state is accelerated, so that the dissolution speed and mining recovery rate are improved. After salt making under sun exposure and frozen nitre making from Saline Lake brine, old brine is adjusted so that the magnesium ion content is concentrated and the value of industrial exploitation is reached, caustic soda method is used to produce magnesium hydroxide of nanoscale, so large magnesium hydroxide production devices of China are built, and comprehensive and efficient utilization of Saline Lake resources and protection and governance of the ecological environment of Saline Lake are realized.

Not only halite but also mirabilite and magnesium salt are dissolved during the salt dissolving and brine-made process by the water force, so the brine ingredients are complicated. Saline Lake is originally solid-liquid coexisting, surface brine especially underground brine is abundant, besides containing the main components of Na⁺, Cl⁻, a Mg²⁺, SO₄²⁻ plasma are also contained. In addition, Saline Lake accepts atmospheric precipitation, condensation of water, surface runoff and surrounding groundwater recharge for 10⁷m³ annually, with variety of salt brought in.

If a single production of salt (NaCl), other useful minerals will be required to remove as harmful impurities, otherwise it is difficult to guarantee the quality of salt, and such vicious spiral and production cannot be carried out. It not only increases the cost but also wastes resources, so comprehensive utilization of Saline Lake brine are the best choice. Brine out of solar salt is stored, and put into nitric

* Corresponding author. E-mail: jltbfy@126.com

field in the winter to make nitre by freezing to achieve sodium sulfate or sodium sulfide production; the content of brine magnesium after being nitrate freezing is high, so could be used to produce chemical products including magnesium hydroxide and Magnesium sulfate, etc. after sunshine enrichment. The industrial chain could continue to extend to produce a variety of fine chemical products and raw materials. Thus, cost of brine production by forced salt dissolving is diluted by comprehensive usage with a variety of output products; the waste that pollute

saline lakes is used effectively; resource conservation and friendly environment are implemented; that the technical feasibility and economic rationality of solution mining method can be fully demonstrated.

Key words: Silt Saline Lake, Solution Mining, Strengthening Measures, Resource Conservation, Comprehensive utilization