



Oilfield geothermal exploitation in China-A case study from the Liaohe oilfield in Bohai Bay Basin

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The clean geothermal energy can play a huge role in solving the problem of severe smog in China as it can replace large coal-fired heating in winter. Chinese government has paid close attention on the development and utilization of geothermal energy. In the "13th Five-Year" plan, the geothermal development is included into the national plan for the first time. China is very rich in the medium and low-temperature geothermal resources, ranking first in the geothermal direct use in the world for a long time. The geothermal resources are mainly concentrated in sedimentary basins, especially in petroliferous basins distributed in North China (in North China, heating is needed in winter). These basins are usually close to the large- and medium-sized cities. Therefore, tapping oilfield geothermal energy have attracted a great attention in the last few years as the watercut achieved above 90% in most oilfields and significant progress has been made. In this paper, taking the Liaohe Oilfield in the Bohai Bay Basin as an example, we discussed the distribution and potential of the geothermal resources, discussed how to use the existed technology to harness geothermal energy more effectively, and forecasted the development prospect of the oilfield geothermal energy. By using the volumetric method, we calculated the geothermal resources of the Guantao Formation, Dongying Formation, Shahejie Formation and basement rock in the Liaohe depression. We tested the geothermal energy utilization efficiency in different conditions by applying different pump technologies and utilizing geothermal energy in different depth, such as shallow geothermal energy (0-200m), middle-deep depth geothermal energy (200-4000m), and oilfield sewage heat produced with oil production. For the heat pump systems, we tested the conventional heat pump system, high-temperature heat pump system, super high-temperature heat pump system, and gas heat pump system. Finally, based on the analysis of national policy, the heat demands of oilfield, and the exploration and development technologies, we discussed the potential of the oilfield geothermal energy development for the industrial and the civil applications in the future.