

Study on Proposal and Application of Simple Evaluation Technique for Geothermal Potential Based on Geological Information

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After the Fukushima nuclear power plant accident caused by the 2011 off the Pacific coast of Tohoku Earthquake and Tsunami, we have been having various discussions about new electric power development. And furthermore, renewable energy attracts our attention. Ground Source Heat Pump (GSHP) system, which is the technology of using characteristics of geothermal and groundwater flow, can satisfy all the demands. This technology can realize energy saving. It is important for the spread of GSHP system to evaluate the land suitability. However, it is difficult to quantitative modeling for groundwater and geological information. Since, method of evaluating geothermal potential, that can be useful for assessment of land suitability for installing GSHP system, is not generalized. In this research, we propose the method of using hydrogeological information which is easy to collect, and apply to the model areas. Thermal conductivity, saturated or unsaturated, and groundwater flow are mainly related to the efficiency of GSHP system. It is thought that the difference is defined by topographical condition and hydrogeological settings of the area. For the purpose of expressing the difference precisely, we collect information of borehole loggings, geological maps, land use and formed the information into GIS data. Secondly, the planar distribution of groundwater level, thickness of aquifer, hydraulic conductivity, thermal conductivity, volumetric heat capacity, Darcy velocity are analysed by GIS. The analysed data contribute to a understanding of phenomenon of heat conduction or advection by groundwater flow. Furthermore, we use software 'Ground Club' which

can estimate heat exchange of unit length of borehole by using 2 parameters, thermal conductivity and volumetric heat capacity, and evaluated the number of borehole heat exchangers and the initial cost. The proposed method is applied to the model areas and the potential maps which can be useful for installing the GSHP system are made.

Keywords: ground source heat pump system, hydrogeological information, geothermal potential map