

Subsurface distribution patterns of temperature and fluid flow at the Sengan (wide Hachimantai) geothermal area, Northeast Japan

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Subsurface temperature contour maps have been described on the basis of bore hole temperature logging data from 78 drill holes using the relaxation method. The wide area as much as 390 km² was extracted as anomalous high temperature zone by the delineation of higher temperature zone than 200 degree C at 2 km below sea level. This value almost equivalent to the world first class geothermal fields. This extensive anomalous high temperature zone suggests the some underlying large-scaled hot rock bodies. The author also calculated the fluid flow vectors based on the obtained subsurface temperature distribution assuming roughly the permeability and porosity distribution for geologic units.

Four geothermal power stations (Sumikawa, Ohnuma, Matsukawa, Kakkonda) have been exploited and operated, and their total output reaches 163 MW /H in the Sengan (wide Hachimantai) geothermal area. As many as about 200 drill holes have been carried out there in order to explore the geothermal energy by the government and private companies. Subsurface temperature contour maps at four levels (0, -500, -1000, -2000m above sea level) have been described on the basis of bore hole temperature logging data from 78 drill holes using the relaxation method. The wide area as much as 390 km² was extracted as anomalous high temperature zone by the delineation of higher temperature zone than 200 degree C at 2 km below sea level. This value excels other Japanese geothermal fields, and almost equivalent to the world first class geothermal fields such as The Geysers, Larderello, Greater Tongonan. This extensive anomalous high temperature zone suggests the some underlying large-scaled hot rock bodies.

The author also calculated the fluid flow vectors based on the obtained subsurface temperature distribution assuming roughly the permeability and porosity distribution for geologic units. The calculated vectors suggest that potential geothermal fields (Sumikawa, Matsukawa, Kakkonda, Nyuto and so on), are supported regionally with fluid supply derived from extensive area. This mechanism is regarded as important factor to assess the sustainability of geothermal reservoir under the condition of its imperfect close system against the surrounding area.